MINERALOGICAL ABSTRACTS

(Vol. 8, No. 2, June, 1941.)

Notices of Books.

NIGGLI (P.), KOENIGSBERGER (J.), PARKER (R. L.), *et alii*. *Die Mineralien der Schweizeralpen*. Basel (B. Wepf & Co.), 1940, 2 vols., 661 pp., 24 pls., 251 text-figs. Price bound 24 Swiss francs.

The underlying motif of this carefully compiled and beautifully illustrated book is the correlation of Swiss minerals with the history and chemistry of the Alpine rocks. The work is divided into five parts. The first volume contains a concise description of Swiss mineral species and localities. Over 200 species are listed and accompanied by 152 crystal drawings. A section follows on rock-forming minerals and principal rock-types. The second and larger part of this volume is a detailed topographical mineralogy of the Swiss Alps. A list of 25 chief mineral assemblages is followed by a full description of 60 'Fundortgruppe' (abbrev. F.G.) grouped in 12 regions and clearly marked on a 1 : 200,000 map at the end of vol. 1. References throughout part II are made to Koenigsberger's previous publications (1917–19) [M.A. **1**–328] and to a list of 113 paragenetic types given in part III. A none too conspicuous explanation of the abbreviations for these references used throughout part II is to be found on p. 109. Part III itself is entitled the mineral deposits of the Central Alps, part IV the history of the mineral deposits found in crevices of the Alpine type, and the book concludes with part V entitled the Alpine mineral deposits and mankind. An alphabetical list of minerals is given at the end of volume 1; and a list of localities and bibliography at the end of volume 2. The work is well printed and serviceably bound, whilst the magnificent photogravures and plates of Swiss localities, mostly taken by F. N. Ashcroft, greatly enhance the value and beauty of the book. F. A. B.

MOTT (N. F.) & GURNEY (R. W.). *Electronic processes in ionic crystals*. Oxford (Clarendon Press), 1940, xii+275 pp., 107 figs. Price bound 18*s*.

A valuable addition to crystal physics. An elementary knowledge of quantum mechanics is essential to a proper understanding of the optical, electrical, and chemical behaviour of ionic crystals, the subject-matter of the book, but assuming this knowledge the treatment given

by the authors is not forbidding. The first section is an introduction to the perfect ionic lattice and includes an interesting discussion of the transition from polar to homopolar binding. Section 2 considers the various types of lattice defect, their diffusion and their contribution to the theory of ionic conduction. Section 3 with the general title electrons in crystals embraces many phenomena including photo-conductivity. Section 4 is a most welcome résumé and extension of our knowledge of colour centres in alkali halides, whilst the remaining sections deal with the topics semi-conductors and insulators, luminescence, photochemistry of silver halides, and lastly an account of processes involving the transport of both ions and electrons. F. A. B.

Stutzer (Otto) [1881–1936]. *Geology of coal.* Translated and revised by Noé (Adolph C.) [1873–1939]. Chicago (University of Chicago Press), 1940, xiii+461 pp., 198 figs. Price $5.00. [Cambridge University Press. Price 30*s.*]

This is a translation with many additions and considerable revision of the second edition (1923) of Stutzer's 'Kohle, allgemeine Kohlengeologie' which appeared as vol. 2 in his series 'Nicht-Erze' [M.A. **6**–196]. Since 1927 he was director of the new institute of fuel-geology in the Mining Academy at Freiberg, and before his death he supplied further material for the translation. The translator was associate professor of palaeobotany in the University of Chicago, and after his death the work was completed by other collaborators. Coal is defined as a combustible rock, and there are chapters on coal as a rock, microscopical examination of coal, and the petrography of coal beds. Other chapters deal with the origin of coal and with the stratigraphy and disturbances of coal beds. The short section on minerals in coal makes no mention of ankerite [Min. Mag. **16**–219, **24**–65] nor of many others that have been recorded [M.A. **7**–336], and there is a confusion between retinite and refkinite. These are, however, minor matters compared with the valuable information that has been brought together in the book. The text is clearly written and there are many good illustrations. At the end of each chapter many useful references are given to the literature. L. J. S.

New Minerals.

McConnell (Duncan). *Clinobarrandite and the isodimorphous series, variscite-metavariscite.* Amer. Min., 1940, vol. 25, pp. 719–725.

Barrandite from Manhattan, Nevada [M.A. **2**–363], gave X-ray powder photographs indicating a mixture of orthorhombic barrandite

and monoclinic clinobarrandite with lattice constants intermediate between those for variscite (*a* 9·85, *b* 9·55, *c* 8·50 Å.) and strengite (*a* 10·05, *b* 9·80, *c* 8·65 Å) and those for metavariscite (*a* 5·15, *b* 9·45, *c* 8·45 Å.) and phosphosiderite (*a* 5·30, *b* 9·80, *c* 8·65 Å.) respectively. The isodimorphous series previously suggested [M.A. **7**–509] is extended:

	Orthorhombic, $V_h^{15} = Pcab$.	Monoclinic, $C_{2h}^5 = P2_1/n$.
$AlPO_4.2H_2O$	Variscite	Metavariscite
$(Al,Fe)PO_4.2H_2O$ ...	Barrandite	Clinobarrandite
$FePO_4.2H_2O$	Strengite	Phosphosiderite
$FeAsO_4.2H_2O$... ...	Scorodite	(Clinoscorodite)
$(Fe,Mn)PO_4.2H_2O$ ...	—	Vilateite ?

Barrandite is mentioned from Gran Roque island, Venezuela, and the 'redondite' from Western Australia [M.A. **5**–148] is also referred to barrandite. Metavariscite intimately intermixed with variscite (Fe_2O_3 1·32 %) is recorded from Candelaria, Nevada. Scorodite gave *a* 10·30, *b* 10·00, *c* 8·90 Å. L. J. S.

Rogers (Austin F.). *Lamprobolite, a new name for basaltic hornblende.* Amer. Min., 1940, vol. 25, pp. 826–828; ibid., Program and Abstracts, December 1940, pp. 11–12 (abstract).

'Basaltic hornblende' (A. G. Werner, 1789) is distinguished from 'common hornblende' by its black lustrous crystals with high refringence and birefringence and strong pleochroism, and it is found in other kinds of volcanic rocks besides basalt. Its high content of ferric iron is due to oxidation of iron [M.A. **4**–391], probably at a late magmatic stage. Lamprobolite (*λαμπρός*, brilliant, and *βολίς*, a missile) is suggested as a more suitable name; 'common hornblende' is then simply hornblende, regarded as a separate species. L. J. S.

Frondel (Clifford). *Constitution and polymorphism of the pyroaurite and sjogrenite groups.* Amer. Min., Program and Abstracts, December 1940, pp. 6–7 (abstract).

The pyroaurite group of rhombohedral hydrous basic carbonates $R'''_2Mg_6(OH)_{16}CO_3.4H_2O$, with Fe in pyroaurite, Cr in stichtite, and Al in hydrotalcite, is isodimorphous with a hexagonal series named the sjögrenite group, comprising the corresponding Fe (sjögrenite), Cr (barbertonite), and Al (manasseite) compounds. The following data are given for these: members of the pyroaurite group contain three molecules in the unit hexagonal cell, and those of the sjögrenite group contain one molecule. The rhombohedral and hexagonal analogues

often occur intimately admixed, and in part the lamellae are mutually oriented in parallel position.

		a.	*c*.	ω.	ϵ.
Rhombohedral	Pyroaurite (Fe)	6·19Å.	46·54Å.	1·564	1·543
	Stichtite (Cr)	6·18	46·38	1·545	1·548
	Hydrotalcite (Al)	6·13	46·15	1·511	1·495
Hexagonal	Sjögrenite (Fe)	6·20	15·57	1·573	1·550
	Barbertonite (Cr)	6·17	15·52	1·557	1·529
	Manasseite (Al)	6·12	15·34	1·524	1·510

L. J. S.

Frondel (Clifford). *Whitlockite: a new calcium phosphate, $Ca_3(PO_4)_2$.* Amer. Min., Program and Abstracts, December 1940, p. 7 (abstract).

Colourless rhombohedra ($10\bar{1}4$) from granite-pegmatite near North Groton, New Hampshire, have sp. gr. 3·12, H. 5, ω 1·629, ϵ 1·626. The unit cell, a 13·65 Å., α 44° 6½′ (a 10·25, c 36·9 Å., $a : c = 1 : 3{\cdot}600$) contains $7Ca_3P_2O_8$ with some Mg and Fe replacing Ca. L. J. S.

Kerr (Paul F.) & Young (Ford). *A new hydrous tungsten oxide from Oruro, Bolivia.* Amer. Min., Program and Abstracts, December 1940, p. 9 (abstract).

Tungstite ($WO_3.H_2O$) has previously been described as an alteration product of ferberite from Oruro. Other material similar in appearance differs from this in its X-ray pattern and optical data. It has the composition $WO_3.2H_2O$ and is named *hydrotungstite*. It appears to be an intermediate product in the alteration of ferberite to tungstite. [Cf. meymacite, $WO_3.2H_2O$, A. Carnot, 1874.] L. J. S.

Volkova (M. I.) & Melentiev (B. N.) Волкова (М. И.) Мелентьев (Б. Н.). *Chemical composition of the Khibiny apatites.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1939, vol. 25, pp. 120–122.

Twelve detailed analyses are given of representative specimens from the several apatite deposits in the Khibina tundra, Kola peninsula [M.A. **6**–308–312]. Seven of them (sp. gr. 3·221–3·314) from the main area show SrO 1·75–3·25 % with rare-earths 0·80–1·24 %. Three others (sp. gr. 3·295–3·355) from isolated deposits at Poachvumchorr, Takhtarvumchorr, and Aeveslogchorr [M.A. **7**–352] contain still more SrO 5·58–11·42 % with more rare-earths 3·22–4·90 %. This massive, greenish-yellow fluor-apatite with high strontium is regarded as a distinct variety and is named *saamite*; a complete description is promised later. It was formed at a lower temperature than the apatite of the main area.

L. J. S.

[Zvyagintzev (O. E.)] Zviagincev (O. E.). *New mineral species of the platinum group.* [Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 26, no. 8, pp. 788–791], abstract in Amer. Min., 1940, vol. 25, p. 710.

Grains from the placers near the Cu-Ni sulphide ore-deposits in the Norilsk district [northern Siberia, M.A. **2**–541] gave Pt 35·50, Pd 3·57, Fe 25·30, Ni 25·64, Cu 9·28, S 0·71, insol. 0·40 = 100·40, and the mineral is named *norilskite*. Other grains contain these constituents in variable proportions. L. J. S.

Lazarenko (E. K.) Лазаренко (Е. К.). *Donbassites, a new group of minerals from the Donetz basin.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 28, pp. 519–521.

Radial aggregates of a foliated mineral, previously mistaken for pyrophyllite, occur in the lode walls and crush zones in ore-deposits and also on slickensides in coal and shale at several places in the Donetz basin. It has been previously described by Y. V. Samoilov (1906) under the name α-chloritite [Min. Mag. **17**–347]. The pearly white folia are flexible and have a perfect cleavage, sp. gr. 2·628, H. $2\frac{1}{2}$, α 1·728, β 1·729, γ 1·735, $\gamma : c = 0°$, 2V 52°, positive. The composition is variable, with a chloritoid nucleus $H_2Al_2SiO_6$ (margaritic acid of V. I. Vernadsky); I from Zhuravka, $H_{14}Al_8Si_5O_{29}$; II Utrennyaia shaft, $H_{18}RAl_{10}Si_6O_{37}$; III Uralskaya vein, $H_{16}RAl_{10}Si_6O_{36}$. Only 0·017 % water is lost at 450°.

	SiO_2.	Al_2O_3.	Fe_2O_3.	MgO.	CaO.	Na_2O.	Li_2O.	H_2O.	Total.
I. ...	34·65	46·03	0·55	1·58	1·82	1·08	0·14	13·96	99·81
II. ...	33·64	45·02	1·38	1·75	2·03	1·30	trace	15·20	100·32
III. ...	34·73	48·08	1·04	0·80	—	—	trace	14·58	99·23

L. J. S.

Godlevsky (M. N.) Годлевский (М. Н.). *Kurnakovite, a new borate.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 28, pp. 638–640.

This occurs at Inder, Kazakhstan, as a dense white granular aggregate. Sp. gr. 1·85, H. 3. The optical characters point to monoclinic symmetry; α 1·489, β 1·510, γ 1·525, optic axial plane (010), 2V 80°, negative. Water is lost at 81–105·4° with an endothermal effect, and at a higher temperature there is no exothermal effect as with inderite and other borates. Analysis, B_2O_3 37·58, MgO 15·46, CaO 0·16, R_2O_3 0·20, SiO_2 0·10, H_2O 47·09, F 0·14 = 100·73, gives the formula $2MgO.3B_2O_3.13H_2O$, similar to that for inderite [M.A. **7**–122] but with less water. L. J. S.

Meteorites and Tektites.

Coulson (A. L.). *A catalogue of meteorites: with special reference to Indian falls and finds, and to specimens in the Indian Museum, Calcutta, as on August 1st, 1939.* Mem. Geol. Surv. India, 1940, vol. 75, ii+346 pp., 6 pls. Price *Rs.* 4–8 or 7*s.*

The main part (pp. 30–231) of this volume is a general catalogue of 1258 known meteorites. This is based on the British Museum catalogue [M.A. **7**–534] and gives fuller details only for the Indian meteorites. Especially useful for purposes of reference are the lists according to the Brezina classification, geographical distribution, and dates of fall or find. The geographical list includes 391 from the United States of America, 116 from India, 98 from U.S.S.R. (Russia and Siberia), and 95 from Australia. A separate classified list is given of the 468 meteorites represented in the Indian Museum. The Brezina symbols for the different types of meteorites are used throughout the volume, and an alphabetical list (pp. 16–18) of these includes (amongst a total of 87) a few that are new. L. J. S.

Nininger (Addie D.). *Third catalog of meteoritic falls (S.R.M. nos. 183–321) reported to the Society for Research on Meteorites: January, 1939, to October, 1940.* [Popular Astronomy, Northfield, Minnesota, December 1940, vol. 48, pp. —.] Reprinted in Contr. Soc. Research on Meteorites, [1941], vol. 2, no. 3 (for 1940), pp. 227–232.

Continuation of previous lists [M.A. **7**–62, 375] giving 139 new meteorites arranged under countries. Many of them have not been described, while those that have been described in the literature are given a misleading reference. L. J. S.

Paneth (F. A.). *The origin of meteorites.* Halley lecture, Oxford (Clarendon Press), 1940, 26 pp., 3 pls. Price 2*s.* 6*d.* (Review in Nature, London, 1941, vol. 147, p. 242.)

This essay opens with the bold statement 'There are three classes of meteorites: iron, stones, and glasses'; and further on it is stated that 'in the case of tektites, it is fairly simple to prove that they must have come down from the atmosphere'. A useful review is given of the geological, astronomical, and physico-chemical evidence bearing on the origin of meteorites; and it is concluded that they belong to the solar system, rather than that they have come from interstellar space. Probably they are fragments of an asteroid of some size which was broken up by disruptive approach. [M.A. **7**–535.] L. J. S.

Proctor (Mary). *Everyman's astronomy.* London (John Gifford), 1939, ix+246 pp., 23 pls. Price 10*s.* 6*d.*

A collection of popular essays on selected subjects. Of the seventeen chapters, four are on meteorites (illustrated with 7 plates) and three on meteors (4 plates). Accounts, mainly copied from other sources but with many errors, are given of the British Museum collection of meteorites, the Arizona meteorite crater, meteoritic irons from South-West Africa, and the great Siberian meteorite. L. J. S.

La Paz (Lincoln). *Criteria for estimating the population of meteoritic showers.* Popular Astronomy, Northfield, Minnesota, 1941, vol. 49, 41–49, 1 fig.

The theory of probability is applied to deducing the number of stones from the number actually collected and the manner of collection. It is concluded that the number of stones of the Holbrook shower must have been of the order of 100,000, and of the Pultusk shower probably many more. [M.A. 7–63.] L. J. S.

Wilson (Ben Hur). *A method for estimating the absolute number of meteorites.* Popular Astronomy, Northfield, Minnesota, 1940, vol. 48, pp. 366–374, 2 figs.

Records of meteorites striking buildings in all parts of the world since 1790 amount to eleven (one every 15 years): of these three were in U.S.A. since 1911 (one every $13\frac{1}{2}$ years). All these were single meteorites striking small buildings. Taking the ratio of the area occupied by buildings in U.S.A. to the total area as 1 : 2500, a simple proportion sum gives 250 falls per annum in U.S.A. L. J. S.

Wylie (C. C.). *The orbit of the Pultusk meteor.* Popular Astronomy, Northfield, Minnesota, 1940, vol. 48, pp. 306–311, 1 fig.

J. G. Galle in 1868, taking the height of appearance of the Pultusk meteor as 171 km. (106 miles), the end point as 42 km. (26 miles), and the time as 6·7 seconds, calculated the velocity as 27·5 km. (17 miles) per second. This has been taken to indicate a hyperbolic orbit from the distance of the stars. Recent observations of detonating fireballs give the height of appearance as about 50 miles. Taking 52 (as observed for Paragould) and the time as 4·6 seconds, the apparent velocity is calculated as 8·1 miles per second (geocentric velocity 4·2, heliocentric velocity 22·4), indicating an elliptical orbit in the solar system. [M.A. 7–535.] L. J. S.

Nininger (H. H.). *Some practical aspects of meteorites.* Popular Astronomy, Northfield, Minnesota, 1940, vol. 48, pp. 381–383.

Various suggestions for lines of research that may lead to results of practical value. L. J. S.

Barnes (Virgil E.). *Pseudotachylyte in meteorites.* Univ. Texas Publ., 1940, no. 3945, pp. 645–656, 1 pl., 1 text-fig.

The black veins in many chondritic stones are compared with the pseudotachylyte veins in South African rocks [M.A. **3**–87, **7**–307]. The material is black and opaque, and contains particles of olivine showing optical strain. Quoted chemical analyses show that the composition is the same as that of the meteorite. In some cases the material has more the character of a mylonite, where there has been crushing without fusion. This rock crushing must have taken place in a body of considerable size before its disruption to yield meteorites. [M.A. **7**–253.]

L. J. S.

Buddhue (John Davis). *The age of meteorites.* Mineralogist, Portland, Oregon, 1939, vol. 7, p. 199.

—— *Age of tektites.* Ibid., p. 405.

Review of recent literature. [M.A. **4**–122, 428; **5**–7, 296, 407; **6**–18; **7**–77, 171, 268, 277, 372, 535, 539.] L. J. S.

Buddhue (John Davis). *Two new constituents of meteoritic gases.* Amer. Journ. Sci., 1940, vol. 238, pp. 569–572.

Powdered meteoritic stones heated in an evacuated cathode tube showed a bluish glow (Holbrook) or a yellow glow (Washougal, M.A. **7**–544), and the emitted gases a bluish-white glow which gave spectral lines of CO, N, H, C_2N_2, He, Ne. Argon was not detected. The presence of cyanogen suggests a connexion between meteorites and comets.

L. J. S.

Buddhue (John Davis). *An analysis of lawrencite in the Mount Elden, Arizona, meteorite.* [Popular Astronomy, Northfield, Minnesota, December 1940, vol. 48, pp. —.] Reprinted in Contr. Soc. Research on Meteorites, [1941], vol. 2, no. 3 (for 1940), p. 233.

A badly cracking slice of this meteorite [M.A. **5**–12, 157] was soaked in methanol giving a dark brown solution and a brown sludge. Fe and Ni (not Cl) were determined in the solution, and 'The composition of the lawrencite was found to be $FeCl_2$, 91·6 %; $NiCl_2$, 8·4 %', representing 1·64 % of the whole material. L. J. S.

Buddhue (John Davis). *Some constituents of meteorite rusts.* Amer. Min., 1940, vol. 25, pp. 435–437.

Analysis of magnetic rust from the Toluca siderite gave Fe_2O_3 74·98, FeO 9·00, (Ni,Co)O 5·15, P 0·13, S trace, H_2O- 0·48, ign. 4·68, insol. 0·88 = 95·30, sp. gr. 3·81, suggesting the presence of magnetite, trevorite, and iron hydroxide. Zaratite [M.A. **7**–377] is also present, but vivianite or sulphates were not found. L. J. S.

Hadding (Assar). *Der Ekerby-Meteorit.* Geol. För. Förh. Stockholm, 1940, vol. 62, pp. 148–160, 12 figs. [M.A. **7**–540.]

At 7.10 a.m. on April 5, 1939, a fireball was seen, roaring noises and three detonations heard, and a stone of 3310 grams was observed to fall close to railway workers in Ekerby parish (56° 2′N., 13° 0′E.), making a hole 35 cm. deep. A fragment of 26 grams fell 8 metres away. It was dug up immediately and was then cold, but adhering clay had dried. The crust shows several stages on the different surfaces; the earliest being 0·2 mm. thick and the latest a slight singeing. It is a grey chondrite with crystals of olivine (2V 83°) and orthorhombic pyroxene (2V 82–86°) and olivine and pyroxene chondrules. Dark glass occurs in the groundmass, in skeletal crystals, and in the chondrules. Analyses by S. Palmqvist give the bulk composition SiO_2 35·18, TiO_2 0·22, P_2O_5 0·29, Cr_2O_3 0·46, Al_2O_3 1·80, Fe_2O_3 0·07, FeO 15·04, MnO 0·25, MgO 22·81, CaO 1·98, Na_2O 0·97, K_2O 0·21, H_2O+ 0·13, H_2O- 0·03, S 1·90, Fe 16·93, Ni 1·73 = 100·00, corresponding to olivine 42, pyroxene 23, nickel-iron 19, troilite 5, glass, &c. 11 %. The nickel-iron contains Fe 90·75, Ni 9·25; olivine Fe_2SiO_4 29, pyroxene $(Fe,Mn)SiO_3$ 18 %. L. J. S.

Selivanov (L. S.) Селиванов (Л. С.). *Chemical analysis of the meteorite "Saratov".* Compt. Rend. (Doklady) Acad. Sci. URSS, 1940, vol. 26, pp. 389–392.

A shower of chondritic stones fell on September 6, 1918, in govt. Saratov [M.A. **2**–258; **3**–254, 255]. Detailed analyses are given of the portions soluble and insoluble in aqua regia of the magnetic fraction (11·1 %) and of the non-magnetic fraction (88·9 %). The soluble portion of the former contains Fe 68·10, Ni 8·90, Co 0·41 %, &c. The non-magnetic portion contains SiO_2 44·83, FeO 14·46, MgO 27·43, troilite 5·53 %, &c. Spectroscopic analysis showed also traces of Cu, Ge, Ga. The bulk composition is not calculated. L. J. S.

Astapowitsch (I. S.). *New data concerning the fall of the Great (Tungus) meteorite on June 30, 1908, in central Siberia.* Popular Astronomy, Northfield, Minnesota, 1940, vol. 48, pp. 433–443, ——, 1 fig. Reprinted in Contr. Soc. Research on Meteorites, [1941], vol. 2, no. 3 (for 1940), pp. 203–226, 1 fig.

This is a translation by L. La Paz and G. Wiens with some critical comments of a paper published in 1933 (Astron. Journ. Soviet Union, vol. 10, pp. 465–486) of which an extract has already been published [M.A. **7**–176]. It gives a historical summary, together with some new data collected in 1928–32 from eye-witnesses, and corrects errors in the original paper and extract. L. J. S.

The Ivuna meteorite. Ann. Rep. Geol. Div. Tanganyika Territory, 1940, for 1939, p. 22.

A meteorite was observed to fall at 5.30 p.m. on December 16, 1938, about 12 miles east of the Ivuna salt pans near the western shore of Lake Rukwa (8° 25′ S., 32° 36′ E.). A complete stone of 704·5 grams with smooth rounded surface landed in a tree and was recovered next day. Two others struck sandy soil about 15 yards apart raising a cloud of dust, but were not found. The very friable, dull black material is that of a carbonaceous chondrite with grains of nickel-iron. L. J. S.

Alderman (A. R.). *A siderolite from Pinnaroo, South Australia.* Trans. Roy. Soc. South Australia, 1940, vol. 64, pp. 109–113, 1 pl.

A much-weathered mass weighing 39·4 kg. (87½ lb.) was ploughed up in 1927 about 9 miles from Pinnaroo (35° 17′ S., 140° 55′ E.). Sections show small irregular grains of metal in a fine-grained brecciated groundmass of silicates (mainly olivine, with clinoenstatite, enstatite, and plagioclase $Ab_{10}An_{90}$) with occasional oval blebs of metal and porphyritic crystals of olivine. The presence of lawrencite and oldhamite (brown, optically isotropic grains with good cleavage) cause the ready decomposition of the mass. The etched metal shows Widmanstetter figures with broad 2 mm. kamacite bands and fine taenite lamellae. Plessite areas show a minute Widmanstetter structure. From linear measurements (metal 44, silicates 51½, troilite 4½ vol. %) and analyses of the metallic (Fe 90·91, Ni 8·94, Co 0·15 %, sp. gr. 7·66) and non-magnetic portions the bulk composition is calculated as: Fe 58·25, Ni 5·73, Co 0·10, troilite 7·76 (Fe 4·94, S 2·82), SiO_2 13·27, Al_2O_3 2·73, FeO 5·43, NiO 0·37, MgO 3·97, CaO 1·80, Na_2O 0·15, K_2O 0·01, H_2O+ 0·31, H_2O- 0·12 = 100·00. The meteorite is a mesosiderite with sp. gr. 5·05. L. J. S.

Barnes (Virgil E.). *Catalogue of Texas meteorites.* Univ. Texas Publ., 1940, no. 3945, pp. 583–612, 2 figs. (maps).

Particulars are given of 70 meteorites (41 stones, 1 stony-iron, and 28 irons) found in Texas, only six of which were observed to fall. Several of them have only recently been recognized and not yet described. A map gives the location of earlier and recent finds of stones of the adjacent Bluff and Cedar showers in Fayette County. Four hundred and eighty three tektites (bediasites) recently recognized in Texas are listed with weights. Foreign ('out-of-State') meteorites and tektites preserved in Texas collections are also listed. L. J. S.

Barnes (Virgil E.). *The stony meteorite from Cuero, Texas.* Univ. Texas Publ., 1940, no. 3945, pp. 613–622, 1 pl.

A much-weathered and cracked stone of 102½ lb. (46·5 kg.) was found in 1936, 4 or 5 feet beneath the surface in the bank of Chisholm Creek, three miles south of Cuero, DeWitt Co. (29° 1′ N., 97° 17′ W.). Open cracks show slickensided surfaces and farther in they pass into veinlets of mylonitic material. Chondrules of various types are present. Variations in optical data indicate that both enstatite and hypersthene are present. Olivine predominates. Analyses by F. A. Gonyer give the bulk composition SiO_2 30·95, TiO_2 0·02, Al_2O_3 2·54, Cr_2O_3 0·26, Fe_2O_3 0·41, FeO 16·61, NiO 0·05, CoO 0·01, MnO 0·20, MgO 21·06, CaO 1·13, Na_2O 0·27, K_2O 0·05, H_2O 1·99, CO_2 0·09, Cl nil, Fe 19·81, Ni 1·69, Co 0·11, Cu 0·01, P 0·13, FeS 3·01 = 100·40. Sp. gr. 3·41. High H_2O and low Fe_2O_3 suggest the presence of serpentinous weathering products. The meteorite is classed as a dark green, veined, spherical hypersthene-chondrite. L. J. S.

Barnes (Virgil E.). *The stony meteorite from Kimble County, Texas.* Univ. Texas Publ., 1940, no. 3945, pp. 623–632, 1 pl.

This weathered stone of 339 lb. (153·8 kg.) was found in 1918 at 30° 25′ N., 99° 24′ W. It is classed as a dark greenish-grey, veined hypersthene-chondrite. The effects of metamorphic action are emphasized. Merrillite is probably present. Analyses by F. A. Gonyer give the bulk composition SiO_2 37·33, TiO_2 0·11, Al_2O_3 3·06, Fe_2O_3 0·09, Cr_2O_3 0·17, FeO 14·47, NiO 0·17, CoO 0·02, MnO 0·14, MgO 23·24, CaO 1·67, Na_2O 0·67, K_2O 0·20, P_2O_5 0·19, Cl nil, H_2O 0·43, Fe 10·63, Ni 0·69, Co 0·06, Cu 0·01, P trace, FeS 3·74 = '100·09'. Sp. gr. 3·43. This is near G. P. Merrill's average composition of stony meteorites.

L. J. S.

Barnes (Virgil E.). *The iron meteorite from Nordheim, Texas.* Univ. Texas Publ., 1940, no. 3945, pp. 633–644, 2 pls., 1 text-fig.

A much-weathered iron of 34 lb. (present weight 15·11 kg.) was ploughed up in 1932 three miles south of Nordheim, DeWitt Co. (28° 52′ N., 97° 37′ W.). The etched surface appears to be structureless, but at certain inclinations of the light schlieren-like streaks shine up. The presence of ten directions of these parallel streaks suggests a relation to the form (210) [? (211), Min. Mag. **22**–277]. Under a high magnification (×230) a minute octahedral structure is seen. The meteorite is classified as a nickel-rich ataxite, but a new group 'microscopic-structured octahedrites with schlieren-like streaks' is suggested. A few small crystals of schreibersite are present. Analysis by F. A. Gonyer gave Fe 87·79, Ni 11·69, Co 0·51, Cu trace, Cl 0·02, C nil, P 0·04, S trace, insol. 0·01 = 100·06; sp. gr. 7·84. L. J. S.

Foshag (William F.). *The Shallowater meteorite; a new aubrite.* Amer. Min., 1940, vol. 25, pp. 779–786, 4 figs.

This meteorite [M.A. **7**–377] from Texas, weighing 4750 grams, was previously described as a diogenite. It is weathered and veined with limonite, and also contains a few specks of vivianite. It consists mainly (81 %) of a firm reticulated aggregate of large (up to 4½ cm. long) bladed crystals of colourless and transparent enstatite, a new analysis of which freed from limonite gave SiO_2 59·92, FeO 0·38, MgO 39·51, CaO 0·32 = 100·13; α 1·653 (1·647), β 1·656 (1·649), γ 1·660 (1·658), 2V 54½°, positive. Small patches of nickel-iron (9 %, containing Ni 6·70 %) and troilite (1½ %) suggest cavity fillings. Forsterite (5 %, α 1·635, β 1·650, γ 1·670, 2V nearly 90°, positive) and oligoclase (2 %, α 1·537, β 1·541, γ 1·545, $Ab_{87}An_{17}$) are seen as small grains only under the microscope. Analysis is given of the portion soluble in nitric acid. The enstatite must have crystallized from a magma without the intermediate stage of clinoenstatite (as suggested by the equilibrium diagrams for MgO–SiO_2 and MgO–FeO–SiO_2 [M.A. **6**–352]); and, as the silicates are free from iron, the nickel-iron and troilite were perhaps later introductions into cavities. L. J. S.

Bullard (Fred M.). *The Bartlett meteorite, Bell County, Texas.* Amer. Min., 1940, vol. 25, pp. 497–500, 2 figs.

A siderite weighing 8·59 kg., sp. gr. 7·444, was ploughed up about 1935 at 5 miles west of Bartlett (30° 50′ N., 97° 30′ W.). It is a medium

octahedrite with some schreibersite and troilite. Analysis by F. A. Gonyer gave Fe 90·41, Ni 8·88, Co 0·47, P 0·22 = 99·98. Spectrographic analysis showed also the presence of Ge, Cu, Si. L. J. S.

Waldschmidt (W. A.). *Flow structure in the Lubbock meteorite, Lubbock, Texas.* Amer. Min., 1940, vol. 25, pp. 528–533, 2 figs.

A weathered stone weighing 1457·8 grams found near Lubbock (33° 55′ N., 101° 51′ W.) was reported in 1939. It is a fine-grained chondrite with olivine, enstatite, nickel-iron, troilite, and haematite. A slice shows three zones in which the distribution of the particles suggests flowage and brecciation. L. J. S.

Nininger (H. H.). *A new type of nickel-iron meteorite from the vicinity of the Arizona meteorite crater.* Popular Astronomy, Northfield, Minnesota, 1940, vol. 43, pp. 328–332, 2 figs.

Amongst several hundred slices of the Canyon Diablo siderite (a coarse octahedrite with 5–7 % Ni, sometimes showing granulation of the kamacite and with varying amounts of schreibersite, four types being distinguished) a few show narrower kamacite bands, which are usually distorted and granulated, more taenite, and contain 8·42 % Ni. This is called 'Canyon Diablo no. 2', and the suggestion is that it was a 'satellite' of the main mass. L. J. S.

Leonard (Frederick C.). *Note on the surroundings of the Goose Lake, California, siderite in situ.* Popular Astronomy, Northfield, Minnesota, 1940, vol. 48, pp. 432–433.

The slight depression surrounding the mass was no doubt due to wind erosion, and there is no external evidence of the fall of the meteorite in situ. [M.A. **7**–379, 543.] L. J. S.

Leonard (Frederick C.). *Meteorites or immigrants from space.* Griffith Observer, Los Angeles, California, 1940, vol. 4, pp. 98–104, 9 figs.

A popular article. Figures are given of the Norfolk siderite [M.A. **7**–69] and of the stone that fell on July 2, 1939, near Washougal, Washington [M.A. **7**–544]. L. J. S.

McMillan (F. A.). *Waterville, Washington meteorite.* Mineralogist, Portland, Oregon, 1940, vol. 8, pp. 223, 239–240.

A mass of iron weighing 75 lb. was ploughed up in 1927 on the Fachnie farm, 16 miles NW. of Waterville, and is in the Ferry Museum

of Tacoma. According to H. H. Nininger it is a medium octahedrite with troilite. L. J. S.

La Paz (Lincoln). *Meteorite craters and the hypothesis of the existence of contraterrene meteorites.* Popular Astronomy, Northfield, Minnesota, 1941, vol. 49, pp. 99–102.

If meteorites consisting of contraterrene atoms (negatively charged nuclei surrounded by positrons) collide with material consisting of ordinary (terrene) atoms, both will be annihilated with explosive violence. This hypothesis is invoked to explain craters around which no meteoritic material has been found and also isolated occurrences of silica-glass. L. J. S.

Young (James). *A statistical investigation of the diameters and distribution of lunar craters.* Journ. British Astron. Assoc., 1940, vol. 50, pp. 309–326, 7 figs.

Measurements were made of the diameters of some 1300 craters in different areas of the moon. The frequency of occurrence of those of different sizes (10–130 miles), especially those showing a central mountain, and their distribution are held to favour the volcanic rather than the meteoritic theory of their origin. [M.A. 7–76.] L. J. S.

Barnes (Virgil E.). *North American tektites.* Univ. Texas Publ., 1940, no. 3945, pp. 477–582, 5 pls., 17 text-figs.

—— *Tektites.* Amer. Min., Program and Abstracts, December 1940, p. 4 (abstract).

Corroded pieces of black glass have long been known in Grimes Co., Texas (30° 37′ N., 96° 6′ W.), and have been cut for ornaments. They are now recognized as tektites and are named bediasites, from a place-name and the Bedias Indians. Over an oval area 10×5 miles 482 pieces have been recently collected; and a single specimen has been found in DeWitt Co., 130 miles to the SW. (possibly transported by man). They occur in gravels overlying Eocene sandstones, and range in weight from $\frac{1}{2}$ to 91·3 grams, averaging $15\frac{1}{2}$ grams. In shape they are lenticular or globular, sometimes with a smooth surface, but usually etched with deep furrows. Sp. gr. 2·334–2·433, n 1·483–1·512. In thin section the glass is brownish and shows well-marked contorted flow structure, with minute bubbles and particles of lechatelierite. Bands of anisotropism due to strain follow the flow structure, and differences in refractive index indicate differences in composition. The extreme values of n

quoted above were determined in one flake. Analyses by F. A. Gonyer of two specimens gave: SiO_2 73·52(77·76), TiO_2 0·87(0·76), Al_2O_3 15·88 (13·30), Fe_2O_3 0·45(0·37), FeO 4·64(3·36), MnO 0·01(0·01), MgO 1·38 (1·19), CaO 0·06(0·04), Na_2O 1·30(1·41), K_2O 1·73(1·97), H_2O 0·08(0·02), NiO, CoO, CuO nil, totals 99·92(100·19); sp. gr. 2·397(2·357), n_{Na} 1·502 (1·492). These tektites are compared with the glass produced when high-tension electric lines are short circuited through soil; and a suggested origin of tektites is that they have been formed when lightning strikes solid rocks such as sandstone and shale (as distinct from fulgurite tubes in loose sand). A detailed review is given of tektite literature, with tabulation of data and plots of chemical analyses, and a bibliography of 285 items. The meteoritic theory of their origin is rejected as an assumption; this theory is not compatible with the presence of particles of lechatelierite (found also in moldavites and believed to represent fused grains of quartz). Glass splashes from meteorite craters are called 'impactites'. L. J. S.

Nininger (H. H.). *The moon as a source of tektites.* Amer. Min., Program and Abstracts, December 1940, p. 9 (abstract).

It is suggested that tektites, and possibly some meteorites, may have been ejected from meteorite craters on the moon. [M.A. **3**–539.]

L. J. S.

Baker (George). *An unusual australite form.* Proc. Roy. Soc. Victoria, 1940, n. ser., vol. 52, pp. 312–314, 2 figs.

Two small (< 1 cm.), bowl-shaped (concavo-convex) australites are described from the Sherbrook river district, Victoria [M.A. **7**–79], and from Western Australia (probably Kalgoorlie). They are supposed to have been shaped in the earth's atmosphere from flat forms. [Min. Mag. **25**–487.] L. J. S.

Zenzén (Nils). *Bemerkungen über den sogenannten Schonit, den falschen Tektit aus Källna in Schonen.* Geol. För. Förh. Stockholm, 1940, vol. 62, pp. 161–172, 5 figs.

[Wiman (C.). *Über den falschen Tektit aus Källna in Schonen.* Bull. Geol. Inst. Univ. Upsala, 1938, vol. 28, pp. 3– .]

The original material from Skåne (= Schonen) described as a tektite by F. Eichstädt (1908) and named schonite by F. E. Suess (1914) is not now available. A previously unpublished analysis by the late R. Mauzelius gave SiO_2 40·69, TiO_2 0·14, Al_2O_3 2·05, Fe_2O_3 0·19, FeO

0·34, MnO 1·08, MgO 4·08, CaO 23·91, Na_2O 1·11, K_2O 17·71, P_2O_5 1·66, &c. This composition is quite distinct from that of any tektite, and it is compared with that of bottle-glass. A glass made of the same composition was subjected to corrosion and melting tests.

L. J. S.

Mathematical Crystallography.

Tertsch (H.). *Bemerkungen zur Herleitung der 32 Kristallklassen.* Zeits. Krist., 1940, vol. 102, pp. 209–215, 2 figs.

An elementary discussion of the thirty-two types of crystal-symmetry.

H. S.

Sinogowitz (Ulrich). *Die Kreislagen und Packungen kongruenter Kreise in der Ebene.* Zeits. Krist., 1939, vol. 100, pp. 461–508, xii+131 figs.

P. Niggli has discussed the problem of packing spheres whose centres are congruent under a group of movements. The author undertakes the similar discussion of circles in two dimensions, obtaining 131 different configurations. H. S.

Jong (W. F. de) & Bouman (J.). *Kristallographische Berechnungen und Konstruktionen mittels des reziproken Gitters.* Zeits. Krist., 1939, vol. 101, pp. 317–336, 8 figs.

The authors discuss the geometrical properties of the reciprocal space-lattice and illustrate its use for crystallographic purposes by the case of babingtonite. H. S.

Donnay (J. D. H.). *Crystal morphology of zircon and rutile.* Зап. Всеросс. Мин. Общ. (Mém. Soc. Russe Min.), 1938, ser. 2, vol. 67, pp. 31–46, 10 figs.

The generalized law of crystal morphology [M.A. 7–241] is applied to zircon and rutile. A method is proposed by means of which it is possible without X-ray diffraction to obtain: (1) the relative dimensions of the unit-cell; (2) the type of the centring of the lattice; (3) the morphological aspect and the corresponding space-group. S. I. T.

Belov (N. V.). *Classification of closest and close packings.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1939, vol. 23, pp. 170–174, 16 figs.

For the layers of cubic close packing the letter *c*, and for the layers of hexagonal close packing the letter *h* are proposed. This allows a

simple designation of various packing arrangements in crystals, e.g. topaz *hchc* . . . A new type of graphic representation of packing arrangement is also proposed. S. I. T.

Terpstra (P.) & Weerden (W. J. van). *Over Barker's systematische kristallografie.* Natuurwetenschappelijk Tijdschrift, Gent, 1938, vol. 20, pp. 285–293, 3 figs.

For triclinic crystals there are 1337 possible configurations some of which are ambiguous; and Barker's rules are inadequate. [M.A. **7**–239.] L. J. S.

Weerden (Willem Jacob van). *Algemeene beschouwingen over Barker's "Principle of simplest indices".* Proefschrift, Groningen (J. B. Wolter), 1938, vi pp. (English summary)+143 pp. (Dutch text), 80 figs. on 2 folding plates.

A very detailed theoretical discussion of the ambiguities which can arise in assigning 'simplest indices' (i.e. indices containing no other figures than 1, 0 and −1) where possible to crystals of the triclinic system. Tables are constructed, by the aid of which it is possible to find in how many and what ways simplest indices may be assigned in any particular case, and possible methods of resolving the ambiguities are discussed. [M.A. **7**–239.] M. H. H.

Parker (Robert L.). *Über winkeltreue Dreiecksprojektion.* Schweiz. Min. Petr. Mitt., 1936, vol. 16, pp. 202–208, 3 figs.

—— *Ein Netz zur winkeltreuen Dreiecksprojektion.* Ibid., 1938, vol. 18, pp. 475–479, 1 pl., 2 text-figs.

—— *Ein Beitrag zur „schematischen" Dreiecksprojektion.* Ibid., 1940, vol. 20, pp. 281–288, 6 figs.

Niggli's triangular projection of crystals (Lehrb. Min., 1924, vol. 1, p. 120) with the poles (100), (010), (001) at the corners of an equilateral triangle shows clearly the relations of poles and zones, but it is a true gnomonic projection only for cubic crystals (projected on (111)). Hints and a net are given for the drawing of such projections. To give the true gnomonic relations for crystals other than cubic the triangular projection is made on a plane at ρ 54° 44′, and distances along the three sides are adjusted to the axial ratios a/b, c/b, c/a. A table of calculated distances is given for axial ratios 0·5, 0·6 . . . 1·9, 2·0, and a gnomonic scale of ratios h/l and k/l. L. J. S.

Parker (Robert L.). *Eine vereinfachte Methode zur Ermittlung der Bildkantenazimute aus der stereographischen Projektion.* Schweiz. Min. Petr. Mitt., 1937, vol. 17, pp. 174–177, 2 figs.

A simplified method of determining from the stereographic projection the direction of edges in crystal drawings [M.A. **4**–442]. L. J. S.

Physical Properties.

Ksanda (C. J.) & Merwin (H. E.). *Improved technique in micropycnometric density determination.* Amer. Min., 1939, vol. 24, pp. 482–484.

One of the chief sources of inaccuracy of measuring the specific gravity of a heavy mineral grain with a micropyknometer lies in the uncertainty of measuring its volume. This has been overcome by illuminating the surface of the meniscus of the water and the flat open end of the pyknometer from a slit source during weighing, and from a series of readings during evaporation, when the water surface changes from concave to convex, the weight is obtained at the moment when the surfaces of the meniscus and pyknometer are completely illuminated. Other precautions are noted and a method of filling the pyknometer is given. F. A. B.

Culbertson (J. L.) & Dunbar (Alver). *The densities of fine powders.* Journ. Amer. Chem. Soc., 1937, vol. 59, pp. 306–308.

The value found by the pyknometric method for the density of a fine powder varies with the liquid used; with charcoal, determinations in water gave 1·821, in benzene 1·994, in CCl_4 1·860, and in petroleum ether 2·083; with silica gel in the same four liquids, values of 2·246, 2·149, 2·132, and 2·125 were obtained. Two factors affect the apparent density of a fine powder—the degree of wetting of the powder (charcoal wets best with organic solvents, silica gel with water), and the degree of compression of the liquid at the interface. M. H. H.

Culbertson (J. L.) & Weber (Martin K.). *The densities of fine powders. II.* Journ. Amer. Chem. Soc., 1938, vol. 60, pp. 2695–2697.

The apparent densities of fine powders of powdered quartz, amorphous silica, and charcoal as determined by pyknometric methods using different immersion liquids and a uniform de-aeration technique show decided variations. Powdered quartz shows a very marked decrease in density on long grinding, due perhaps to formation of amorphous material. Provided complete elimination of air is attained, the nature of the immersion liquid is immaterial for relatively coarse

powders, but with fine powders a compressible or a highly polar liquid tends to give high results. M. H. H.

Anderson (B. W.). *The use of ethylene dibromide in hydrostatic weighing.* Gemmologist, London, 1940, vol. 9, pp. 141–143, 1 fig.

Ethylene dibromide has a low surface tension and d 2·18385 at 18° C. (Egerton and Lee, 1923), but as d varies in different samples the exact value for the sample used must be determined by calibration with quartz (d 2·651 at 15° C.) and a table compiled giving the variation for each 0·1° C. An example is given of the accurate determination of d of a gemstone by this method. L. J. S.

Teichert (Curt). *Corrasion by wind-blown snow in polar regions.* Amer. Journ. Sci., 1939, vol. 237, pp. 146–148.

Blackwelder (Eliot). *The hardness of ice.* Ibid., 1940, vol. 238, pp. 61–62.

(1) The hardness of ice is given as $1\frac{1}{2}$–2, but this is at a temperature near the melting-point. J. P. Koch and A. Wegener (1930) determined for Greenland ice at −44° C. a hardness of 4. At this temperature it would act as a sand-blast in rock corrasion. (2) Ice cooled in solid CO_2 (−78·5° C.) was found to have a hardness of 6. L. J. S.

Adams (L. H.). *Elastic properties of materials of the earth's crust.* Chapter 4 (pp. 71–89, 1 fig.) in Physics of the earth, vol. 7, New York and London, 1939.

A review of work done on the compressibility and elastic constants of minerals and rocks, and the relation of these to the velocity of earthquake waves. Many of the compressibility data are tabulated. L. J. S.

Griggs (David). *Creep of rocks.* Journ. Geol. Chicago, 1939, vol. 47, pp. 225–251, 12 figs.

Apparatus is described for measuring the deformation of rock samples subjected to compressive stress below the elastic limit for long time-periods. An empirical equation has been derived for the deformation or creep which is identical with that used recently by engineers for describing the creep of steel. The deformation is made up of two components, one a reversible elastic flow and the other a pseudo-viscous flow constant under constant stress over long periods. Measurements on dry specimens of limestone, boric anhydride glass, halite, calcite, talc, alabaster, and shale are given. The greatly increased rate of creep

observed for wet alabaster is attributed to an irreversible pseudo-viscous flow due to recrystallization under stress (E. Riecke, 1895).

F. A. B.

Griggs (David). *Experimental flow of rocks under conditions favoring recrystallization.* Bull. Geol. Soc. Amer., 1940, vol. 51, pp. 1001–1022, 2 pls., 2 text-figs.

Goranson (Roy W.). *"Flow" in stressed solids: an interpretation.* Ibid., pp. 1023–1033.

Describes further experiments on the deformation of alabaster specimens under stress when surrounded by water both at atmospheric pressure and when the surrounding water is under hydrostatic pressures up to 1000 atmospheres. Temperature and pressure alone produce small deformations in rocks, but when solution and recrystallization are possible the rate of flow becomes relatively rapid. The second paper is a thermodynamical treatment of the problem, and equations are derived which are in accordance with observation. F. A. B.

Birch (Francis) & Bancroft (Dennison). *New measurements of the rigidity of rocks at high pressure.* Journ. Geol., Chicago, 1940, vol. 48, pp. 752–766, 3 figs.

By determining the resonant frequencies of torsional vibration of a cylinder of a rock it is possible to calculate, knowing its length and specific gravity, the velocity of shear waves and rigidity. Drill cores of various sedimentary and metamorphic rocks were used for such measurements, and data were obtained for temperatures up to 150° C. and pressures up to 9000 kg./cm^2. The dependence of shear wave velocity upon composition of the rock samples is discussed. [M.A. **7**–400.] F. A. B.

Birch (Francis) & Clark (Harry). *The thermal conductivity of rocks and its dependencies upon temperature and composition.* Amer. Journ. Sci., 1940, vol. 238, pp. 529–558, 613–635, 10 figs.

The thermal conductivity of rocks of various types, glasses, and single crystals were determined with specially designed apparatus between 0° and 500° C. Conductivity decreases with increasing temperature, except for the poorest conductors (glasses and anorthosite). Amongst rocks, peridotites and sandstone are the best conductors. Values at 0° C. for quartz are $27{\cdot}3 \times 10^{-3}$ cal./cm. sec. deg. C. parallel to the principal axis and 16·3 perpendicular to this axis; for calcite 9·56 parallel to axis and 8·30 perpendicular to axis; for halite 14·6. L. J. S.

Rosenholtz (Joseph L.) & Smith (Dudley T.). *Linear thermal expansion and inversions of quartz, var. rock crystal.* Amer. Min., 1941, vol. 26, pp. 103–109, 1 fig.

An apparatus for measuring the thermal expansion of quartz is described in which the movement of a mercury column in a capillary tube registers the expansion. Sections cut $\perp^r$ and $\|^l$ to the *c*-axis were cut from a clear quartz crystal, sp. gr. 2·649, from Minas Geraes, Brazil, and gave values close to those of Sosman. The α–β inversion-point observed was 573·1$\pm$0·5° C., and a second change was found in all sections cut $\perp^r$ to the *c*-axis at 872$\pm$1° C., corresponding to the quartz–tridymite inversion. Only one section cut $\|^l$ to the *c*-axis gave this second inversion-point at 871·5° C., whereas the remaining three sections showed a sudden acceleration in the rate of contraction at 830$\pm$2° C.

F. A. B.

Austin (J. B.), Saïni (H.), Weigle (J.), & Pierce (R. H. H., *Jr.*). *A direct comparison on a crystal of calcite of the X-ray and optical interferometer methods of determining linear thermal expansion. Evidences of differences among calcite crystals.* Physical Rev. (Amer. Phys. Soc.), 1940, ser. 2, vol. 57, pp. 931–933, 1 fig.

Rods cut from a large clear crystal of calcite from Big Timber, Montana, gave by the optical method at 50° C.: along *c*-axis $25{\cdot}1 \times 10^{-6}$, *a*-axis $-4{\cdot}9$, perpendicular to (100) 10·8; at 300° C. 28·1 and $-4{\cdot}7$ respectively. Nearly the same results were obtained by the X-ray powder method. A tabulation of previously published results for calcite shows some variation.

L. J. S.

Cohen (Ernst) & Bredée (H. L.). *Der negative Ausdehnungskoeffizient des Jodsilbers.* Proc. Acad. Sci. Amsterdam, 1936, vol. 39, pp. 358–360.

The value found by G. Jones and F. C. Jelen (1935) for the negative expansion coefficient of α-AgI is invalid as their material probably contained some β-AgI.

M. H. H.

Brady (James J.) & Moore (William H.). *Actinoelectric effects in tartaric acid crystals.* Physical Rev. (Amer. Phys. Soc.), 1939, ser. 2, vol. 55, pp. 308–311, 7 figs.

An electric current flows through a crystal of tartaric acid when it is illuminated with an arc-light. The effect has been studied for different directions in the specimen and for different wave-lengths.

F. A. B.

Hofstadter (R.) & Herman (R. C.). *Photoconductivity of crystalline willemite at low temperatures.* Physical Rev. (Amer. Phys. Soc.), 1939, ser. 2, vol. 56, p. 212.

Herman (R. C.) & Hofstadter (R.). *Observations on the dark current of a willemite crystal.* Ibid., 1940, vol. 57, p. 936.

A peak of photoconductivity is shown by a crystal of willemite at −150° C. when exposed to light of wave-length 2965 Å. L. J. S.

Smith (F. Gordon). *Variation in the electrical conductivity of pyrite.* Univ. Toronto Studies, Geol. Ser., 1940, no. 44, pp. 83–93, 5 figs.

Rectangular blocks cut in various crystallographic directions from a single crystal of pyrite from Leadville, Colorado, give specific resistances ranging from 4·3 to 71·5 ohms/cm. cube. The resistance figure has rhombohedral symmetry. Oriented and random blocks cut from 35 crystals give a range of 0·021–246 ohms/cm. cube. This variation is not connected with the locality or with habit, colour, lustre, streak, or optical anisotropism. Temperature of formation may be related to conductivity, but heat-treatment produces no change. The extreme types give identical X-ray powder photographs. M. A. P.

Notation for piezo-electric quartz. National Physical Laboratory, London (H.M. Stationery Office), 1938, 10 pp., 4 figs. Price 3*d.*

Quartz disks are widely used as resonators and frequency stabilizers in electrical circuits used in telephone and telegraph systems. Confusion of nomenclature in defining the directional properties of quartz led to a report being drawn up by various institutions upon which this pamphlet is based. The crystallography and crystal physics of quartz are briefly discussed. The conventional lettering adopted for the axes is $X = [11\bar{2}0]$, $Y = [10\bar{1}0]$, and $Z = [0001]$. F. A. B.

Booth (C. F.) & Sayers (C. F.). *The production of quartz resonators for the London-Birmingham coaxial cable system.* Post Office Elect. Engin. Journ. London, 1939, vols. 31 and 32, reprint 23 pp., 41 figs.

Details are given of how quartz crystals are examined optically and then if suitable cut accurately parallel to given directions for use as resonators. Interesting applications have been made of the technique familiar to mineralogists and a section of particular interest is that dealing with artificially produced etch patterns on the (0001), $(10\bar{1}0)$, and $(11\bar{2}0)$ faces of quartz. F. A. B.

Osterberg (Harold). *A new form of crystalline quartz at −183·5° C.* Physical Rev. (Amer. Physical Soc.), 1936, vol. 49, pp. 552–553, 2 figs.

Balamuth (L.), Rose (F.), & Quimby (S. L.). *Note on δ quartz.* Ibid., p. 703.

(1) Below −183·5° C., a new non-piezoelectric form of quartz (δ-quartz) is formed, with a small change in the optical rotary power.

(2) Quartz is still piezoelectric at −195° C. M. H. H.

Krishnan (K. S.) & Banerjee (S.). *Magnetic studies on braunite, $3Mn_2O_3.MnSiO_3$.* Zeits. Krist., 1939, vol. 101, pp. 507–511, 1 fig.

The magnetic susceptibilities of two specimens of braunite containing 1·2 and 2·5 % ferrous oxide have been measured along and perpendicular to the tetragonal axis. It is deduced that the magnetic anisotropy of iron-free braunite should be less than $0{\cdot}17\times10^{-6}$ per gram, which is much less than would be expected if the mineral contained $Mn^{\cdots}$ ions. The observed low anisotropy of braunite supports the formula $3Mn^{\cdot\cdot}Mn^{\cdots\cdot}O_3.Mn^{\cdot\cdot}SiO_3$. F. A. B.

Krishnan (K. S.) & Banerjee (S.). *The magnetic anisotropy of manganite crystal in relation to its structure.* Trans. Faraday Soc., 1939, vol. 35, pp. 385–387.

The magnetic anisotropy of a manganite crystal with iron content less than 0·01 % is at 31° C. $\chi_c-\chi_a = 4{\cdot}0\times10^{-6}$ and $\chi_c-\chi_b = 3{\cdot}0\times10^{-6}$. From these low values it is concluded that the Mn atoms in this mineral are half divalent and half tetravalent. [M.A. 7–402.] F. A. B.

Haraldsen (Haakon). *Eine thermomagnetische Untersuchung der Umwandlungen im Troilit-Pyrrhotin-Gebiet des Eisen-Schwefel-Systems.* Zeits. Anorg. Chem., 1937, vol. 231, pp. 78–96, 7 figs.

—— *Die Umwandlungen des Eisen(II)-Sulfids.* Zeits. Elektrochem., 1939, vol. 45, pp. 370–372, 2 figs.

—— *Omvandlingene i troilit-blandkrystallområdet.* Tidsskr. Kjemi og Bergvesen, Oslo, 1939, vol. 19, pp. 144–147, 3 figs.

A study of the magnetic properties of pyrrhotine and their variation with composition and temperature. There are two or more magnetic transitions, one of which is correlated with the disappearance of the superlattice. The cause of ferromagnetism in the system is discussed. M. H. H.

Crystal-optics.

Kaiser (E. P.) & Parrish (William). *Preparation of immersion liquids for the range n_D = 1·411 to 1·785.* Indust. Engin. Chem., Analytical Edition, 1939, vol. 11, pp. 560–562, 2 figs.

Tables are given of the volumes (c.c.) required for mixing the following pairs of liquids to give a range of liquids with refractive index in steps of 0·005. *n*–Decane (n_D 1·411 at 22° C.) and 'medium government [U.S.] oil' [i.e. paraffin] (1·466); 'medium government oil' and α-chloronaphthalene (1·633); α-chloronaphthalene and methylene iodide (1·739); and methelyne iodide with dissolved sulphur (up to 1·785).

L. J. S.

Bosazza (V. L.). *Notes on refractive index liquids.* Amer. Min., 1940, vol. 25, pp. 299–301.

The refractive indices of various kerosene fractions are given. Mixtures of a suitable fraction with α-bromonaphthalene maintain their values for many months. F. A. B.

Hoyt (H. C.) & Lindsay (Geo. A.). *A simple method for demonstrating and measuring approximately the index of refraction of crystalline substances for X-rays.* Physical Rev. (Amer. Physical Soc.), 1936, vol 49, pp. 498–501, 4 figs.

A simple method for determining the refractive index of a crystal for X-rays is described, and measurements on cerussite given for several wave-lengths. M. H. H.

Quirke (T. T.) & Lacy (W. C.). *Measurements of the indices of refraction in anisotropic media.* Amer. Min., 1939, vol. 24, pp. 705–724, 10 figs. Corrections, ibid., 1940, vol. 25, p. 314.

Two half-cylinders of calcite, one a semicircle the other a half-ellipse in cross-section, were made in order to measure the refraction of the ordinary and extraordinary rays in all crystallographic directions. Observed and calculated values are in close agreement. F. A. B.

Vedenejeva (N.), Grum-Gržimajlo (S.), & Volkov (A.). *Détermination au microscope des indices de réfraction des substances résineuses et des minéraux de haute réfringence.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1935, new ser., vol. 4 (of 1935), pp. 207–210, 1 fig. [M.A. 7–403.]

Tertsch (H.). *Zwei graphische Methoden zur Bestimmung optischer Werte an bestimmten Kristallflächen.* Min. Petr. Mitt. (Tschermak), 1939, vol. 51, pp. 163–171, 4 figs.

Nomograms are given for a monoclinic crystal, with hornblende as an example, for the determination of: (1) extinction-angle on (010) from measurements of 2V and of the extinction-angle on (110); (2) α, β, and γ from the values determined on chance sections and the lie of the optic axes. L. J. S.

Chapman (Carleton A.). *A model to illustrate isogyres in interference figures.* Amer. Journ. Sci., 1940, vol. 238, pp. 805–810, 4 figs.

On a disk of cardboard are marked the points of emergence of the optic axes and many small black crosses giving the vibration-directions at various points in the field. Rotated over this is another disk with the corresponding number of slits parallel to the vibration-direction of the polarizer. A templet of hyperbolic curves enables the vibration-directions on the first disk to be correctly orientated. L. J. S.

Malmqvist (David). *Zur Optik des Arsenkieses im sichtbaren Spektrum. Vergleichende Messungen mit dem Spaltmikrophotometer nach Berek und einer neuen Doppelphotozellenmethode.* Bull. Geol. Inst. Univ. Upsala, 1937, vol. 26, pp. 1–26, 9 figs.

Measurements were made in red, yellow, and green light of the reflective powers in air and oil in various directions on crystals of mispickel with the slit-microphotometer [M.A. **5**–124] and a new double photo-cell method. From the data obtained the refractive and absorption indices are calculated. L. J. S.

Chatterjee (Narayanchandra). *Struktur-Untersuchungen von natürlichem und künstlichem Yttrofluorit mit Hilfe der Fluoreszenz- und Absorptionsspektren.* Zeits. Krist., 1940, vol. 102, pp. 245–284, 9 figs.

The absorption and emission spectra of natural yttrofluorite from Hundholmen in north Norway and of a series of artificial yttrofluorites were measured, and Debye-Scherrer photographs were also taken. The natural crystals contain about 14 % of YtF_3 and have the same structure as CaF_2, which is the case in the artificial crystals when the YtF_3 does not exceed 50 %. For higher percentages of YtF_3 the structure becomes more complicated, indicating the existence of various mixed crystals. [M.A. **7**–530.] H. S.

Rutherford (R. L.). *Asterism in selenite.* Univ. Toronto Studies, Geol. Ser., 1940, no. 44, pp. 71–74, 1 fig.

Cleavage plates held close to the eye and in line with a candle flame 4 feet away show one, two, or three bands of light which are perpendicular to the traces of (100), (111), and ($\bar{1}$11) on (010). The effect is not due to oriented impurities or cavities. M. A. P.

McKinley (D. W. R.). *Measurement of small optical activities with the quartz crystal light modulator.* Canadian Journ. Research, 1939, vol. 17, sect. A, pp. 202–207, 2 figs.

An apparatus is described in which polarized light is passed through a quartz crystal maintained in piezoelectric oscillation and after passage through an analyser falls on a photoelectric cell and amplifying system. The apparatus may be employed as a polarimeter for small angles of rotation, which can be measured with an accuracy of about 10 seconds of arc. M. H. H.

Molière (Gert). *Dynamische Theorie der Kristalloptik.* Ann. Physik, 1935, ser. 5, vol. 24, pp. 591–608.

The mathematical treatment developed by M. von Laue for X-ray optical theory has been adapted to longer wave-lengths and yields satisfactory results, covering birefringence and optical activity.

M. H. H.

Mueller (Hans). *Theory of the photoelastic effect of cubic crystals.* Physical Rev. (Amer. Physical Soc.), 1935, vol. 47, pp. 947–957, 3 figs.

A theory of the photoelastic effect (strain-birefringence) in certain classes of cubic crystals is developed, and the meagre observational data discussed; good agreement is obtained. The signs of the photoelastic effect should furnish a check on the correct assignment of a crystal to certain lattice types (NaCl, CsCl, CaF_2, ZnS, and Na_2O types).

M. H. H.

Atkinson (R. d'E.). *Energy and angular momentum in certain optical problems.* Physical Rev. (Amer. Physical Soc.), 1935, vol. 47, pp. 623–627.

A simplified experimental proof that circularly polarized light possesses angular momentum is described. The experiment involves moving interference fringes, and it is shown that these can arise only

when one of the two interfering beams of light does more work than the other before they are brought to interference. Five optical experiments bearing on these two theorems are described and discussed.

M. H. H.

Matossi (F.) & Bronder (O.). *Das ultrarote Adsorptionsspektrum einiger Silikate.* Zeits. Physik, 1938, vol. 111, pp. 1–17, 8 figs.

The infra-red absorption-spectra of zircon, topaz, benitoite, aquamarine, muscovite, biotite, adularia, and a soda glass were studied; an interpretation of the observed absorption bands is put forward.

M. H. H.

Matossi (Frank) & Krüger (Hans). *Das ultrarote Reflexionsspektrum von Silikaten. II.* Zeits. Physik, 1936, vol. 99, pp. 1–23, 10 figs.

The infra-red reflection spectra of willemite, zircon, fayalite, olivine, sillimanite, chondrodite, thortveitite, hemimorphite, benitoite, cordierite, aenigmatite, anthophyllite, serpentine, antigorite, talc, nepheline, cancrinite, scapolite, sodalite, natrolite, danburite, datolite, axinite, epidote, zoisite, leucite, sphene, topaz, adularia, heulandite, and lithium tungstate have been examined. The interpretation of the spectra is discussed in relation to the structures of the several minerals.

M. H. H.

Barnes (R. Bowling) & Bonner (Lyman G.). *The Christiansen filter effect in the infrared.* Physical Rev. (Amer. Physical Soc.), 1936, vol. 49, pp. 732–740, 11 figs.

The history and application of the Christiansen filter effect—the approximately monochromatic transmission given by a moderately coarse suspension in which the dispersed and continuous phases have the same refractive index for the transmitted wave-length—is discussed. It is pointed out that a little on the short wave side of a strong absorption band the refractive index of a selectively absorbing substance is often less than unity; for this wave-length air can function as the continuous phase, and filters of this nature for several wave-lengths in the infra-red are described. The phenomenon may also be used as a method of refractive index determination. M. H. H.

Ellis (Joseph W.) & Bath (Jean). *Infra-red pleochroism and Fermi resonance associated with CH_2 groups in crystals.* Physical Rev. (Amer. Physical Soc.), 1939, ser. 2, vol. 55, pp. 1098–1099, 2 figs.

Pleochroism in the infra-red, due to parallel orientation of CH_2 groups in the crystal, is very marked for pentaerythritol and diketopiperazine. The particular vibrations responsible for the different absorption bands are identified. M. H. H.

Michalke (Heinrich). *Quantitative Untersuchungen der Polarisation der Raman-Linien von Kristallen.* Zeits. Physik, 1938, vol. 108, pp. 748–770, 2 figs.

A method has been developed for the quantitative measurement of the degree of polarization of the Raman spectrum lines of crystals, and applied to calcite, beryl, and quartz. The results are discussed theoretically and the several spectrum lines assigned to particular atomic vibrations. In general, agreement with the results of work on infra-red spectra is obtained. M. H. H.

Raman (C. V.) & Nedungadi (T. M. K.). *Lattice oscillations in crystals.* Nature, London, 1939, vol. 143, p. 679, 1 fig.

The Raman spectrum of sodium nitrate differs markedly with different directions of vibration of the incident light; the relation of this direction to the links which are excited is deduced and the experimental results illustrate these conclusions. M. H. H.

Raman (C. V.) & Nedungadi (T. M. K.). *The α–β transformation of quartz.* Nature, London, 1940, vol. 145, p. 147, 1 fig.

Allen (H. S.). *The α, β transformation of quartz.* Ibid., pp. 306–307.

The spectra of scattered monochromatic light in quartz show for one prominent line a progressive change from 15° up to near the transition point at 575° C. L. J. S.

Nedungadi (T. M. K.). *The effect of temperature on the Raman spectrum of quartz.* Proc. Indian Acad. Sci., Sect. A, 1940, vol. 11, pp. 86–95, 1 pl., 7 text-figs.

Spectra are recorded of the scattered light from quartz at temperatures from −192° to 530° C., and the variations discussed. A bibliography includes 36 references to the Raman spectrum of quartz.

L. J. S.

Instruments and Apparatus.

Hugill (W.). *A note on an improved apparatus for the separation of heavy minerals.* Trans. Brit. Ceram. Soc., Stoke-on-Trent, 1940, vol. 39, p. 120, 1 fig.

Description of a simple glass apparatus without rubber connexions or stopcock for separating minerals with heavy liquids. F. A. B.

[Kvasha (L. G.)] Кваша (Л. Г.). Результаты испытания интерференционного микрорефрактометра.—Kvasha (L. G.). *Results of the interferential microrefractometer tests.* Зап. Всеросс. Мин. Общ. (Mém. Soc. Russe Min.), 1938, ser. 2, vol. 67, pp. 247–257, 4 figs. (Russian with English summary.)

A discussion of the calibration of the apparatus and of measurements of refractive indices on the interference micro-refractometer [M.A. **6**–444]. S. I. T.

Jelley (Edwin E.). *A microrefractometer and its use in chemical microscopy.* Journ. Roy. Microscop. Soc., 1934, ser. 3, vol. 54, pp. 232–245, 8 figs.

Edwards (A. E.) & Otto (C. E.). *A microrefractometer of simple design.* Indust. Engin. Chem. (Anal.), Amer. Chem. Soc., 1938, vol. 10, pp. 225–226, 2 figs.

(1) A microprism of liquid is prepared by cementing a bevelled coverslip of 0·2 mm. thickness to a plane glass plate so as to give a re-entrant angle which will take 0·01 c.c. of liquid. An illuminated slit is viewed through a small aperture partially covered by this microprism, and the apparent displacement of the slit observed on a scale in the plane of the slit. A temperature controlling device is also described. Refractive indices and temperature coefficients are given for a selection of immersion liquids. A selection of aqueous solutions with refractive indices up to 1·62, suitable for use with organic substances, is also listed. An accuracy of the order of 0·001 in the refractive index is claimed.

(2) Minor modifications in the above instrument are described.

M. H. H.

Ehringhaus (A.). *Drehkompensatoren mit besonders großem Meßbereich.* Zeits. Krist., 1939, vol. 102, pp. 85–111, 10 figs.

A modification of the Berek type of compensator giving a much greater range of measurement. F. A. B.

Thibault (Newman W.). *A simple dichroscope.* Amer. Min., 1940, pp. 88–90, 1 fig.

A simple Haidinger dichroscope may be constructed by cutting four quadrants of polaroid and mounting them between cover glasses so that

the vibration-directions of two adjacent quadrants are mutually perpendicular. The composite polaroid disk is then fitted to one end of a brass tube provided with an adjustable eyepiece. F. A. B.

Takô (Hikotarô). *A new type of polarimeter.* Sci. Papers Inst. Physical & Chem. Research, Tokyo, 1938, vol. 34, pp. 391–398, 6 figs.

If a line source of light (slit) is employed and a second slit arranged in a suitable position in the eyepiece, the large Nicol prisms required in a polarimeter may be replaced by Wollaston double-image prisms. M. H. H.

Jelley (E. E.). *An improved grating microspectrograph and its use in chemical microscopy.* Journ. Roy. Microsc. Soc., 1936, ser. 3, vol. 56, pp. 101–112, 2 pls., 4 text-figs.

An improved form of micro-spectrograph is described, and its application to the rapid determination of chromatic dispersion of optic axial angles, birefringence, and pleochroism on small crystals with considerable accuracy. M. H. H.

Bowen (E. J.). *Light filters for the mercury lamp.* Journ. Chem. Soc. London, 1935, p. 76.

A series of solutions is described adapted for the isolation of monochromatic light of several wave-lengths in the visible and ultra-violet from the light of the mercury arc. M. H. H.

Russanow (A. K.). *Über eine Mikro-Bohrmaschine zur Abscheidung der Einschlüsse in den Schliffen.* Mikrochemie, Wien & Leipzig, 1937, vol. 21 (for 1936–37), pp. 98–101, 2 figs.

One tube of a binocular microscope is replaced by a support for a steel needle, which serves as a drill. M. H. H.

Dimler (R. J.) & Stahmann (M. A.). *A mount for the universal stage study of fragile materials.* Amer. Min., 1940, vol. 25, pp. 502–504, 2 figs.

Descriptions and drawings of a universal stage mount for the examination of fragile grains in an immersion liquid between two cover glasses. F. A. B.

Bell (James Forbes). *Notes on the use of methyl methacrylate "lucite" in a geological laboratory.* Econ. Geol., 1939, vol. 34, pp. 804–811, 4 figs.

Methyl methacrylate is a liquid of low viscosity (d 0·9497, n_D 1·4168,

m.p. −48° C.) which polymerizes at 40–45° to a clear, colourless, hard, and tough solid (*d* 1·19–1·20, *n* 1·482–1·521, softening at 80–125°). It is not attacked by strong acids or alkalis and can be used as a film inside glass vessels, for embedding crystals for deformation experiments, &c.

L. J. S.

Wright (F. E.). *The splitting of mica (muscovite) for optical purposes.* Amer. Journ. Sci., 1939, vol. 237, pp. 736–741.

Strips of mica, bevelled at the edges and held between two plates of glass, are split with a fine needle and soft-wood spatulas. The accurate measurement with the petrographical microscope of the phase angle of a mica plate is explained. Quarter-wave plates supplied by makers were found to range from 70° to 110°. L. J. S.

Clays.

Schofield (R. K.). *Clay mineral structures and their physical significance.* Trans. Brit. Ceram. Soc., Stoke-on-Trent, 1940, vol. 39, pp. 147–161, 3 figs.

An account of the crystal-structures of clay minerals with especial reference to the presence of positively and negatively charged zones. Measurements of ionic retention enable these charges to be measured and their variations with *p*H studied. Support is found for the view that a network tends to form in clay suspensions through attraction between the positive and negative zones of neighbouring crystals.

F. A. B.

Grim (Ralph E.). *Properties of clay.* Recent marine sediments (Amer. Assoc. Petroleum Geol., Tulsa, Oklahoma), 1939, pp. 466–495. Separates as Circular 49, Illinois State Geol. Survey, 1939.

Recent work has indicated that, with the exception of allophane, clay minerals are crystalline and fall into three main groups, kaolinite, montmorillonite, and muscovite (var. illite). A résumé of recent work is given in which are included useful tables of optical properties and chemical analyses. F. A. B.

Edelman (C. H.), Baren (F. A. van), & Favejee (J. Ch. L.). *Mineralogische onderzoekingen aan kleien en kleimineralen. I. General discussion of the mineralogical composition of clays and qualitative X-ray analysis of some Dutch clays.* Mededeelingen van de Landbouwhoogeschool, Wageningen, 1939, vol. 43, pp. 1–39.

Favejee (J. Ch. L.). — *II. Quantitative X-ray analysis of some Dutch soils.* Ibid., pp. 43–51, 2 pls., 4 text-figs.

Hardon (H. J.) & Favejee (J. Ch. L.). — *III. Qualitative X-ray analysis of the clay fraction of the principal soil types of Java.* Ibid., pp. 55–59.

The first paper consists of a useful historical summary of clay mineralogy followed by tabulated X-ray powder data for α-quartz, muscovite, kaolinite, and montmorillonite. The second paper contains excellent reproductions of powder photographs of the above minerals and also of four centrifuged fractions of a Dutch clay soil showing how the mineral composition varies with particle-size. The estimation of the mineral content of a mixture from the intensity of the powder lines of each component leads for clays to a deficiency in the total of 15–50 %; the smaller the grain-size the greater the deficiency. Whilst the possibility of the presence of amorphous material has not been completely excluded, the chief reason for the deficiency is attributed to the X-ray patterns changing with reduced particle-size. Particularly do the basal reflections of clay minerals decrease in intensity, so that quantitative estimation should be restricted to the prism reflections which unfortunately show very little variation from one clay mineral to another. The only minerals so far found in fractions of Dutch clays are quartz, muscovite, kaolinite, and montmorillonite, the first of the four minerals only in fractions $>0{\cdot}1\mu$. The percentage of muscovite and probably montmorillonite in these clays increases with decrease in particle-size. The three main soil types of Java are lateritic (principal clay-mineral kaolinite), 'mergelgronden' (montmorillonite), and limestone soils (metahalloysite $Al_2O_3.2SiO_2.2H_2O$). F. A. B.

Norton (F. H.). *Hydrothermal formation of clay minerals in the laboratory, Part II.* Amer. Min., 1941, vol. 26, pp. 1–17, 13 figs.

Previous work has been repeated using higher pressures of CO_2 and water-vapour [M.A. 7-479]. The same end-products are obtained, but it is now considered that montmorillonite or beidellite, not pyrophyllite, is formed from anorthite. The maximum reaction rate of CO_2 and water-vapour on various finely ground minerals occurs at 300° C. and 500 lb. per sq. in. pressure. At higher pressures reactions come to a standstill. Stronger acids do not always produce higher conversion rates. The end-products, while similar to the various clay minerals, are not identical with them in X-ray pattern or thermal behaviour.

F. A. B.

Armstrong (Lee C.). *Decomposition and alteration of feldspars and spodumene by water.* Amer. Min., 1940, vol. 25, pp. 810–820, 2 figs.

Analysed samples of microcline, albite, and kunzite were ground under water to particles less than 0·1μ in diameter. The felspars lost over 50 % alkalis and the kunzite 44 % lithia by electrodialysis, and all the constituents of these minerals diffused through the membrane of the dialyser. It was concluded that not only the alkalis but also silica and alumina were present in solution as ions and that clay minerals may be formed partly by ionic reactions. Dehydration data of the decomposed minerals showed that about 50 % of the water could not be expelled at 100° C. and that it was adsorbed on the mineral particles. X-ray powder photographs detected no new mineral after dialysis, but treatment of the dialysed residues at 300° C. in a steel bomb gave quartz and perhaps kaolinite lines on the photographs. F. A. B.

Bradley (W. F.). *The structural scheme of attapulgite.* Amer. Min., 1940, vol. 25, pp. 405–410, 3 figs.

Chemical analysis of a centrifuge fraction 0·05 to 0·10μ of clay from Attapulgus, Georgia, gave SiO_2 55·03, Al_2O_3 10·24, Fe_2O_3 3·53, MgO 10·49, K_2O 0·47, H_2O+ 10·13, H_2O- 9·73, total 99·62. Refractive index γ 1·540, $\gamma-\alpha$ 0·032, and 2V is negative and small. X-ray 'fibre' photographs of flake-shaped aggregates distinguish the mineral from clay minerals with basal cleavage and yield cell-dimensions $a \sin\alpha$ 12·9, b 18, c 5·2 Å., with content $2[(OH_2)_4(OH)_2Mg_5Si_8O_{20}.4H_2O]$. Silicon–oxygen chains like those in amphibole lie parallel to the c-axis and the interstices between them are filled by chains of water molecules which can be removed by heating to 100° C. Eight water molecules per unit cell co-ordinated about Mg are less easily removed and four (OH) groups per unit cell represent water not driven off below 500 or 600° C. A section of the crystal-structure parallel to (010) is the same as a layer of montmorillonite structure parallel to (001) in which one layer of water molecules is present. This explains how optical data fail to distinguish the two minerals. [M.A. 7–99.] F. A. B.

Gieseking (J. E.). *The mechanism of cation exchange in the montmorillonite-beidellite-nontronite type of clay minerals.* Soil Science, 1939, vol. 47, pp. 1–12, 1 pl., 4 text-figs.

Fractions of various clays of montmorillonite type, particle-size $< 1\mu$, dispersed in distilled water were treated with aqueous solutions of the hydrochlorides and hydroiodides of various amines. Complete

flocculation resulted. Powder photographs of Wyoming bentonite to which have been added known amounts of tributyl mono-heptyl ammonium iodide are reproduced. The measured (001) spacings show that the replacement of Ca, Na, and H ions in the original clay by ammonium ions increases the spacing. The intensity of the (001) diffractions increases with the amount of amine salt added. Ammonium substitution-products of montmorillonite-type clays no longer exhibited the water adsorption, swelling, and dispersion characteristics of the Ca, Na, and H montmorillonites. F. A. B.

Ensminger (L. E.) & Gieseking (J. E.). *The adsorption of proteins by montmorillonitic clays.* Soil Science, 1939, vol. 48, pp. 467–471, 1 fig.

Samples of protein-montmorillonite were prepared by mixing aqueous suspensions of gelatine or albumen with a montmorillonite suspension fractionated from Wyoming bentonite, and then acidifying with acetic acid. X-ray photographs of the resulting protein-montmorillonite show that the (001) spacing varies from 12 Å. for untreated montmorillonite up to 37·3 Å. for gelatine-montmorillonite containing 33 % montmorillonite by weight. The increases in spacing are still larger for albumen-montmorillonite. The amount of adsorption of the protein by the clay mineral is higher for higher hydrogen-ion concentrations. F. A. B.

Brammall (A.), Leech (J. G. C.), & Dunstall (W. J.). *Montmorillonite in fuller's earth, Nutfield, Surrey.* Geol. Mag. Hertford, 1940, vol. 77, pp. 102–112, 1 fig.

The chief constituent of fuller's earth is a member of the montmorillonite-beidellite family. Chemical analyses are given of elutriated clay-fractions and base-exchange products prepared from the Nutfield earth. Dehydration data are also given for three of the fractions. The Nutfield clay-fractions differ from beidellite in possessing lower aluminium, but higher iron and magnesium content. F. A. B.

Sedletzky (I. D.). *Genesis of montmorillonite and kaolinite and conditions of their joint occurrence in the colloids of soils and clays.* Compt. Rend. (Doklady) Acad. Sci. URSS, 1939, vol. 22, pp. 510–514, 3 figs.

Acid conditions in soils favour the formation of kaolinite minerals, and alkaline conditions the formation of montmorillonite and beidellite. Soils containing a mixture of these minerals have been proved to be derived from montmorillonite-bearing clays. S. I. T.

Gruner (John W.). *Cristobalite in bentonite.* Amer. Min., 1940, vol. 25, pp. 587–590.

Chemical and X-ray data show that two samples of bentonite from Wyoming contain about 20 % of cristobalite, the rest montmorillonite even in fractions as fine as 1·25μ. Other bentonites and fuller's earths also contain cristobalite. F. A. B.

Gruner (John W.). *Abundance and significance of cristobalite in bentonites and fuller's earths.* Econ. Geol., 1940, vol. 35, pp. 867–875.

X-ray powder photographs show that α-cristobalite, in grains smaller than 2μ, constitutes perhaps 10–50 % in twelve bentonites and fuller's earths from Montana, Wyoming, Colorado, Texas, Missouri, and Illinois. The cristobalite is always associated with montmorillonite, and it seems to have no detrimental effect on fuller's earth. Cristobalite appears to alter to quartz in these sediments, but its origin is unexplained.

M. A. P.

Barth (Tom. F. W.). *Norske mineraler av beidellit-gruppen.* Norsk Geol. Tidsskrift, 1939, vol. 19, pp. 300–310, 5 figs. (Norwegian with English summary.)

Chemical analyses are given of fresh and weathered quartz-monzonite, and of clayey material filling crevices in the weathered rock, from Lyngdal and Lista in southern Norway. The last contains 55–60 % $Al_2O_3.2SiO_2.3\frac{1}{2}$–$4H_2O$, with α 1·51, β and γ 1·535–1·54, $2V \sim 0°$, negative, which is identified as beidellite. This material is supposed to have been formed by rock weathering in pre-glacial times. Norwegian clays are mostly of glacial origin and consist of fine, unweathered rock powder.

L. J. S.

Cuthbert (F. Leicester). *Petrography of two Iowa loess materials.* Amer. Min., 1940, vol. 25, pp. 519–527.

Specimens of grey and brown loess were subjected to mechanical analysis and the various fractions studied by chemical, optical, and X-ray methods. The brown loess is essentially montmorillonite and the grey loess is composed chiefly of illite and kaolinite. F. A. B.

Bosazza (V. L.). *Occurrence of vanadium and molybdenum in clays* Nature, London, 1940, vol. 146, p. 746.

Bricks made from South African clay of Karroo age often show after weathering a canary-yellow efflorescence. This is soluble in hot water

and contains V and Mo. Clay when heated at 1000° C. and extracted with hot water gave MoO_2 0·08 and spectroscopically abundant V.

L. J. S.

Camerman (C.). *Données sur la constitution chimique des argiles belges.* Bull. Soc. Belge Géol., 1940, vol. 49 (for 1939), pp. 80–115.

Many chemical analyses are given of clays from various geological formations and suitable for various purposes. L. J. S.

Wentworth (C. K.), Wells (R. C.), & Allen (V. T.). *Ceramic clay in Hawaii.* Amer. Min., 1940, vol. 25, pp. 1–33, 11 figs.

The physical properties are given of clay samples from various Hawaiian localities. Chemical analyses, optical, and X-ray examination of clay from Koolau show that the clay is predominantly illite admixed with kaolinite and fine-grained quartz. The powder photographs do not, however, reveal what mineral present is responsible for the titania content of 14–15 %. It is suggested that the Koolau clay is derived from the weathering of basaltic lavas. F. A. B.

Nagelschmidt (G.), Desai (A. D.), & Muir (Alex.). *The minerals in the clay fractions of a black cotton soil and a red earth from Hyderabad, Deccan State, India.* Journ. Agricult. Sci. Cambridge, 1940, vol. 30, pp. 639–653, 1 pl., 2 text-figs.

The mineral composition of two clays has been determined for three ranges of particle-size, 1·4–0·1, 0·1–0·06, and $< 0·06\mu$, using chemical, optical, dehydration, and X-ray data. There is practically no variation in the mineralogical composition of the clay throughout the profile, but there is variation with particle-size. The red clay, probably eluvial, is predominantly kaolinite or halloysite, whilst the black 'illuvial' clay contains mainly beidellite. F. A. B.

Bosazza (V. L.). *Wonderstone—a unique refractory material.* Trans. Brit. Ceram. Soc., Stoke-on-Trent, 1940, vol. 39, pp. 369–376, 6 figs.

Bluish-grey compact cryptocrystalline pyrophyllite from Gestoptefontein, SE. Transvaal [M.A. 7–457], with α 1·534, β 1·586, γ 1·596, 2V 60°$\pm$5°, [negative], sp. gr. 2·84, yields SiO_2 58·45, TiO_2 2·35, Al_2O_3 31·27, Fe_2O_3 0·84, MgO 0·12, CaO 0·05, Na_2O 0·30, K_2O 0·16, SO_3 0·10, H_2O+ 4·88, H_2O- 0·23, C 1·33, total 100·08. The mineral contains needles of rutile and minute grains of amorphous carbon. On firing to

1200° C. the colour changes from grey to pink, and thin sections show that the material consists of an interlocking mass of mullite and rutile with finely dispersed cristobalite. The sp. gr. falls to 2·53 and the compression strength increases from 9500 to >20,000 lb. per sq. in. The very good working properties of the mineral before firing render it suitable for resistance formers and electric furnace muffles. Its finely fibrous nature and freedom from porosity after firing also suggest its use for ultra-filtration. F. A. B.

Miscellaneous.

Quervain (F. de). *Zur Kenntnis des Titanklinohumites (Titanolivin)*. Schweiz. Min. Petr. Mitt., 1938, vol. 18, 591–604, 1 pl., 4 text-figs.

Titanclinohumite (= titanolivine) is not uncommon in Alpine serpentines [M.A. **5**–430]. It is now described from Selva near Poschiavo and from glacial moraines in the Saas valley, occurring with diopside, magnetite, perovskite, &c. in antigorite-serpentine. It is reddish-brown with strong pleochroism. Material from Alpe Canciano near Selva gave α 1·691, β 1·700, γ 1·724, 2V 58°, and analysis by J. Jakob: SiO_2 36·24, TiO_2 5·20, Al_2O_3 0·37, Fe_2O_3 4·69, FeO 6·20, MnO 0·30, MgO 46·05, H_2O+ 1·23 = 100·28. This gives the formula $(Mg,Fe,Ti)_9Si_4(O,OH)_{18}$ or $4Mg_2SiO_4.Mg(O,OH)_2$. L. J. S.

Pagliani (Giovanna). *Flogopite e titanolivina di Monte Braccio (Val Malenco)*. Atti Soc. Ital. Sci. Nat. Mus. Civ. Milano, 1940, vol. 79, pp. 20–22.

Violet-brown plates, 4½ cm. across, of phlogopite in crystalline limestone, together with diopside, titanolivine, and graphite, have sp. gr. 2·714, α 1·549, β 1·583, γ 1·585, and gave analysis SiO_2 35·64, TiO_2 2·83, Al_2O_3 15·13, Fe_2O_3 2·65, FeO 1·55, MnO —, MgO 27·62, CaO trace, Na_2O 3·58, K_2O 6·49, H_2O+ 4·23, H_2O- 0·81, F —, total 100·53, agreeing with $K_2O.6MgO.Al_2O_3.5SiO_2.2H_2O$. The orange-red grains of titanolivine have α 1·664, β 1·670, γ 1·691. L. J. S.

Hata (Shin). *The alteration of allanite*. Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1939, vol. 36, pp. 301–311, 1 fig.

Analyses of the reddish-brown earthy crust on weathered crystals of allanite from the granite of the Abukuma range, Japan, are compared with analyses of the fresh crystals [M.A. 7–464]. The material consists mainly of ferric hydroxide, Al_2O_3, SiO_2, and CO_2. It shows an increase in the amount of ThO_2, but most of the rare-earths have been extracted.

Powdered allanite digested with K_2CO_3 solution gives up most of the rare-earths, leaving a residue similar to the weathered material.

L. J. S.

Billiet (V.) & Vandendriessche (A.). *Les oxydes hydratés de cobalt du Katanga.* Bull. Soc. Belge Géol., 1940, vol. 49 (for 1939), pp. 63–78, 1 pl.

X-ray powder photographs of heterogenite, stainierite, mindigite, and trieuite from Katanga and of heterogenite from Goodsprings, Nevada, and Gowganda, Ontario, show identical patterns, and these minerals are to be regarded as varieties of the heterogenite group, differing in the relative amounts of Co_2O_3 and CuO, and in their microscopical appearance in reflected light. The amount of water varies with the size of the grains. Their general formula is $(Co_2O_3,CuO).H_2O$. Glassy trieuite from Star of Congo mine gave the same X-ray pattern after heating at 180° in a sealed tube with water. L. J. S.

Rao (B. Rama) & Rao (M. B. Ramachandra). *Spodumene and its associated minerals from the Ooregum mine, Kolar gold field.* Rec. Mysore Geol. Dept., 1939, vol. 37, pp. 38–42.

Large (6 inches long) tabular crystals of purplish-grey to greenish spodumene occur in pegmatite with lithiophilite, native arsenic, apatite, tourmaline, beryl, sillimanite, kyanite, &c. Pale green material gave α 1·653, β 1·667, γ 1·678, $\gamma:c = 26°$, 2V 58°, and analysis by E. R. Tirumalachar SiO_2 64·16, Al_2O_3 27·74, FeO 1·03, MnO 0·32, Li_2O 5·80, Na_2O 1·03, H_2O 0·52 = 100·60. L. J. S.

Geijer (Per). *Kentrolite in a metamorphic manganese-iron ore of sedimentary origin.* Geol. För. Förh. Stockholm, 1939, vol. 61, pp. 204–208.

A manganiferous variety of the Archaean quartz-banded iron-ore of Klintgruvan, near Krylbo in central Sweden, shows in thin section haematite, braunite, schefferite, rhodonite, garnet, hyalophane, and a brown pleochroic mineral with high birefringence. The optical determination of the last as kentrolite ($2PbO.Mn_2O_3.2SiO_2$) is confirmed by the following analysis, by A. Bygdén, of the ore, which is compared with the Långban ores. SiO_2 28·35, TiO_2 0·05, Al_2O_3 2·37, Fe as Fe_2O_3 30·82, Mn as MnO 28·99, MgO 0·81, CaO 2·10, BaO 2·29, PbO 0·86, Na_2O 1·35, K_2O 0·40, P_2O_5 0·05, H_2O+ 0·48, S 0·01 = 98·93. L. J. S.

Robitsch (J.). *Kalkspatskelette aus dem Quecksilberbergbau Stockenboi, Kärnten.* Zeits. Krist., 1940, vol. 102, pp. 216–217, 2 figs.

Skeleton crystals of calcite, heretofore only known in artificial crystals, have been found occurring naturally in a habit consisting of the six surfaces of a negative rhombohedron which is probably $(0\bar{1}12)$.

H. S.

Gordon (Samuel G.). *Results of the Chilean mineralogical expedition of 1938. Part I.—The identity of lapparentite with tamarugite.* Notulae Naturae, Acad. Nat. Sci. Philadelphia, 1940, no. 57, 9 pp., 6 figs.

Tamarugite is noted from six localities in the Atacama Desert where it occurs as granular or fibrous masses and as well-developed crystals in association with various other sulphates. The colourless monoclinic crystals with perfect (010) cleavage gave goniometric measurements agreeing closely with those for lapparentite [M.A. **5**–391; **6**-149, 357; **7**–224]. In addition to 26 crystal-forms previously noted for lapparentite, ten new forms are listed. Three analyses agree closely with the accepted formula $Na_2SO_4.Al_2(SO_4)_3.12H_2O$ for tamarugite. H_2O at 104° 15·10 %, H_2O+ 15·11. Sp. gr. 2·07, α 1·484, β 1·486, γ 1·497, $\beta = b$, $\alpha:c = +4°$, 2V large, positive. Sodium may perhaps have been overlooked in the analyses of some other minerals: it is suggested that leucoglaucite [M.A. **5**–391; **6**–149] may be identical with ferrinatrite, and alumian with natroalunite.

L. J. S.

Posnjak (E.). *Deposition of calcium sulfate from sea water.* Amer. Journ. Sci., 1940, vol. 238, pp. 559–568, 1 fig.

Curves of the solubilities of gypsum and anhydrite in solutions of sea salts of various concentrations at 30° C. indicate that gypsum would be deposited when the salinity is between 3·35 and 4·8 times the normal concentration of sea water, and anhydrite when above 4·8. Sedimentary marine deposits of pure anhydrite must therefore either be at least partly derived from originally deposited gypsum, or have been formed close to or above 42°—the transition point of the two minerals in saturated aqueous solutions. [M.A. **7**–288.]

L. J. S.

Himmel (Hans). *Eisenoxydmonohydrat (Goethit).* Zentralbl. Min., Abt. A, 1939, pp. 281–286, 3 figs.

Goethite (α-FeOOH) and lepidocrocite (γ-FeOOH) are now distinguished as α-goethite and γ-goethite respectively, because by interchanging and halving the axes the ratios $a:b:c$ show a relation: for

α-FeOOH 0·2295 : 1 : 0·303, and for γ-FeOOH 0·246 : 1 : 0·308 [M.A. **7**–464]. Goniometric measurements are given of crystals of goethite ('α-goethite') from Oberstein, Germany; Gogebic iron range, Michigan; and Lostwithiel, Cornwall. On those from Lostwithiel a new form *t* (061) is referred to axes $a:b:c = 0{\cdot}459:1:0{\cdot}303$. L. J. S.

Groves (R. C.). *Exfoliation of vermiculite by chemical means.* Nature, London, 1939, vol. 144, p. 554.

Exfoliation takes place in H_2O_2. L. J. S.

Frankel (J. J.). *Etching reagent for chromite.* Nature, London, 1940, vol. 146, pp. 198–199, 1 fig.

The polished section is placed face downwards in a porcelain crucible leaving a space below. Perchloric acid (70 %) is added and heated until it begins to fume and has evaporated. Symmetrical reticulate patterns are developed. Cube faces are etched more slowly than (111) and (110). L. J. S.

Schofield (W.). *Calcite nodules in Keuper Marl at Upton, Wirral.* Proc. Liverpool Geol. Soc., 1940, vol. 18, pp. 4–6.

Caspell (J.). *A note on the composition of the Upton nodules.* Ibid., pp. 7–8.

Crystals (thin plates, hexagonal prisms, and rhombohedra) of calcite line hollow nodules in a fine-grained red sandstone with subordinate marl. They contain $CaCO_3$ 98·7, $MgCO_3$ 1·3 %. The surrounding rock contains $CaCO_3$ 2·8, $MgCO_3$ 4·2 %. The sandstone, with flakes of muscovite lying in all directions, is probably a loess deposit. L. J. S.

Friend (J. Newton) & Allchin (John P.). *Presence of less common elements in rocks.* Nature, London, 1939, vol. 143, p. 762.

Spectroscopic analysis showed the presence of Ni (probably as carbonate) and V in calcite from Cannington Park near Bridgwater, and of Ni (probably as silicate) in calcite from Weston-super-Mare. Te is present in sulphur from Krisuvik, Iceland [Min. Mag. **26**–9]. L. J. S.

Saldanha (R.). *Mineraes da mina de Furnas: cerussita.* Bol. Fac. Phil. Sci. Let. Univ. São Paulo, 1938, no. 8 (Mineralogia no. 1), pp. 2–14, 2 pls., 1 text-fig.

—— —— *anglesita e calamina.* Ibid., pp. 15–25, 5 figs. (Portuguese with Latin summary.)

Crystallographic descriptions are given of minerals from the oxidized

zone of a vein of argentiferous galena in the Furnas mine, Iporango, São Paulo. Cerussite shows 22 crystal-forms including a doubtful new form $R\{4.10.5\}$ [$a : b : c = 0{\cdot}6100 : 1 : 0{\cdot}7230$] and is twinned on (110) and (130); α 1·7989, β 2·0722, γ 2·0741, 2V 8° 19′ (Na). Anglesite shows 13 forms and gave $a : b : c = 0{\cdot}7766 : 1 : 1{\cdot}2153$, differing somewhat from values previously recorded. Hemimorphite as small (2–4 mm.) crystals tabular on (010) shows 8 forms and gave $a : b : c = 0{\cdot}7812 : 1 : 0{\cdot}4773$; α 1·6132, β 1·6166, γ 1·6355, 2V 45° 56′. L. J. S.

Saldanha (R.). *Estudo morphologico e estatistico da phenacita de S. Miguel de Piracicaba.* Bol. Fac. Phil. Sci. Let. Univ. São Paulo, 1938, no. 10 (Mineralogia no. 2), pp. 29–73, 3 pls., 10 text-figs. (Portuguese with Latin summary.)

The excellent, doubly-terminated crystals (up to $10\frac{1}{2}$ cm.) of phenakite occurring with green mica, amazonite, quartz, &c. in pegmatite at San Miguel de Piracicaba in the centre of Minas Geraes have often been described since 1909 [M.A. **2**-416, **4**–189], and 26 crystal-forms have been previously noted. To this list 28 more forms are now added, 23 of which are new for the species. Detailed measurements gave $a : c = 1 : 0{\cdot}6610$, α 108° 0′ $53\frac{1}{3}''$. These forms and their zones are discussed statistically and they confirm the law of Goldschmidt. L. J. S.

Franco (R. R.). *Sobre a baritina de Araxá.* Bol. Fac. Phil. Sci. Let. Univ. São Paulo, 1938, no. 8 (Mineralogia no. 1), pp. 27–33, 5 figs. (Portuguese with Latin summary.)

Localities for baryte in Brazil are listed and crystals (5–6 cm.) from Araxá in Minas Geraes are described. These show ten crystal-forms and gave $a : b : c = 0{\cdot}8156 : 1 : 1{\cdot}3123$; α 1·6333, β 1·6433, γ 1·6495, 2V 37° 7′ (Na). L. J. S.

Franco (R. R.). *Breve noticia sobre a hematita de Antonio Pereira.* Bol. Fac. Phil. Sci. Let. Univ. São Paulo, 1938, no. 10 (Mineralogia no. 2), pp. 75–79, 1 pl., 2 text-figs. (Portuguese with Latin summary.)

With the granular haematite of Antonio Pereira in Minas Geraes rosettes of brilliant tabular crystals are common, but single crystals, tabular or rhombohedral of cubic habit, are rare. Goniometric measurements are given for 12 crystal-forms. L. J. S.

Jakob (J.). *Über das Auftreten von dreiwertigem Titan in Biotiten.* Schweiz. Min. Petr. Mitt. 1937, vol. 17, pp. 149–153.

In the following analyses the amount of $KMnO_4$ used in the titration was greater than that required for the oxidation of the iron assuming it to be all present as FeO; the excess is allotted to Ti_2O_3. I, phlogopite from Burgess, Ontario; II, phlogopite, large crystals in marble from Ascona, Tessin; III, biotite from the Derome felspar quarry, Halland, Sweden, ω 1·671, ϵ 1·548.

	SiO_2.	TiO_2.	Ti_2O_3.	Al_2O_3.	FeO.	MnO.	MgO.	Na_2O.	K_2O.	H_2O+.	F.
I.	41·18	0·39	0·54	12·52	0·30	0·04	27·32	0·88	11·93	1·06	6·74
II.	40·69	0·51	0·29	16·62	0·03	0·02	26·28	1·08	10·18	4·40	0·00
III.	35·40	1·99	2·07	11·66	28·61	0·63	6·72	1·36	0·12	2·31	0·26

L. J. S.

Jakob (J.). *Chemische und röntgenographische Untersuchungen an Amphibolen. III. Mitteilung: Über die Qualität des Analysenmankos.* Schweiz. Min. Petr. Mitt., 1937, vol. 17, pp. 220–229, 2 figs.

The deficiency (<100 %) in hornblende analyses has been attributed to oxygen or to the difficulty of expelling all the water. In a special apparatus at 1000° C. no oxygen was given off, but all the water; and the totals of the following analyses show no deficiency. I, basaltic hornblende from Junkersbühl, Baden; II, hornblende from a granite-pegmatite contact at Bodio, Tessin; III, hornblende in amphibolite from Cadagno lake, Tessin.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	MgO.	CaO.	Na_2O.	K_2O.	H_2O+.	Total.
I.	41·09	3·59	12·40	3·69	5·60	0·10	15·10	11·05	2·54	1·92	3·22	100·30
II.	40·60	0·91	10·63	7·39	14·56	0·30	7·85	10·62	1·80	1·67	4·00	100·33
III.	45·12	1·68	11·93	3·59	8·91	0·15	12·40	10·23	1·84	0·33	3·94	100·12

L. J. S.

Jakob (J.). *„Magnesiaglimmer von Morawitza".* Schweiz. Min. Petr. Mitt., 1938, vol. 18, pp. 473–474.

An analysis by J. Rumpf (1874) under this title showed K_2O 7·64, H_2O 3·58 %, and the mineral has been called eukamptite. Chlorite-like material from the same locality (Moravicza = Ocna de Fer, Banat, Romania), as light green scales, brittle with poor basal cleavage, and optically negative with small axial angle, gave SiO_2 36·97, TiO_2 0·10, Al_2O_3 13·75, Fe_2O_3 1·05, FeO 0·64, MnO 0·12, MgO 26·77, Na_2O 1·38, K_2O 5·81, H_2O+ 11·30, H_2O- 2·26, total 100·15. Formula, $15SiO_2.3Al_2O_3.18MgO.2K_2O.15H_2O.3H_2O$. L. J. S.

Jakob (J.). *Der Turmalin von Karharia stream, Kodarma, Britisch Indien.* Schweiz. Min. Petr. Mitt., 1938, vol. 18, pp. 605–606.

Analyses of three crystals of tourmaline [colour?] gave: SiO_2 35·46, 36·03, 36·01; TiO_2 1·01, 0·84, 0·77; Al_2O_3 32·37, 32·79, 32·70; B_2O_3 10·45, 9·56, 10·66; FeO 2·26, 2·16, 2·59; MnO 0·03, 0·03, 0·03; MgO 10·73, 11·07, 10·99; CaO 2·71, 2·49, 2·28; Na_2O 1·64, 1·54, 1·09; K_2O 0·06, 0·06, 0·06; F 0·13, 0·09, 0·41; H_2O+ 3·29, 3·41, 2·72; totals 100·14, 100·07, 100·31 (less O for F 100·09, 100·03, 100·14); sp. gr. 3·045, 3·058, 3·075.

L. J. S.

Jakob (J.). *Drei Analysen von Beryll.* Schweiz. Min. Petr. Mitt., 1938, vol. 18, pp. 607–609.

I, water-clear beryl from Bob Ingersoll mine, Keystone, South Dakota. II, aquamarine in pegmatite from Cresciano, Tessin [ω_D 1·5792, ϵ_D 1·5704, ibid., 1939, vol. 19, p. 496]. III, emerald in biotite-schist from Habachthal, Salzburg. Analyses I and II agree with $6SiO_2.1Al_2O_3.3BeO.\frac{1}{2}H_2O$. The colour of the aquamarine is attributed to ferric iron. Chromium could not be detected in the emerald.

	SiO_2.	Al_2O_3.	BeO.	MgO.	CaO.	Na_2O.	K_2O.	H_2O+.	Total.*	Sp. gr.
I.	64·76	18·91	12·83	—	—	1·23	0·23	1·96	100·07	2·713
II.	64·99	17·17	12·89	0·31	0·16	1·08	0·29	1·62	'100·08'	2·685
III.	63·10	14·08	11·07	3·37	2·31	2·32	0·29	2·76	100·07	2·780

* I, also Li_2O 0·14, H_2O- 0·01. II, also Fe_2O_3 0·97. III, also TiO_2 0·04, FeO 0·70, MnO 0·03.

L. J. S.

Jakob (J.). *Über den Chemismus des Andalusits.* Schweiz. Min. Petr. Mitt., 1940, vol. 20, pp. 8–10.

Alkalis have been previously found in kyanite [M.A. 7–257]; and are now shown in the following analyses of andalusite: I, olive-green gem material from Minas Geraes, Brazil; II, opaque crystals from Fop Tiamarsch, Silvretta, Graubünden. In II allowing for 5 % admixed mica there still remains 3·4 % of alkalis. It is suggested that the presence of alkali is necessary for the formation of andalusite, and that on cooling it partly separates as mica.

	SiO_2.	Al_2O_3.	Fe_2O_3.	MgO.	Na_2O.	K_2O.	H_2O+.	Total.	Sp. gr.
I. ..	36·31	62·13	0·52	0·23	0·40	0·21	0·36	100·16	3·158
II. ..	34·80	58·42	0·34	nil	1·63	2·36	2·49	100·04	3·106

L. J. S.

Jakob (J.) & Quervain (F. de). *Zwei Chloritsande aus alpinen Zerrklüften.* Schweiz. Min. Petr. Mitt., 1939 [i.e. 1940], vol. 19 (for 1939), pp. 307–309.

Chlorite sand in crevices in green-schist consists of scales and short prisms 0·1–0·5 mm. across. Two samples, bright green from Vals (and dark green from Val Cristallina) gave: SiO_2 26·01 (25·39), Al_2O_3 20·57 (21·49), Fe_2O_3 6·42 (9·51), FeO 18·09 (17·23), MnO 0·37 (0·22), MgO 16·26 (15·76), Na_2O 1·21 (1·25), K_2O 0·34 (0·84), H_2O+ 10·82 (8·33), total 100·09 (100·02), sp. gr. 2·91 (2·92), ω 1·624 (1·625), ϵ 1·627 (1·628). These data point to ripidolite. L. J. S.

Casasopra (S.). *La presenza della tapiolite nelle pegmatiti di Cresciano (Riviera), Ticino.* Schweiz. Min. Petr. Mitt., 1938, vol. 18, pp. 441–450, 5 figs.

Small tetragonal crystals of tapiolite from pegmatite veins in Leventina gneiss show the forms $a(100)$, $r(230)$, $m(101)$, $n(203)$?, $s(111)$, and new $f(233)$, $l(253)$ [$a : c = 1 : 0{\cdot}6464$]. Sp. gr. 7·33, H. 6–6½. Analysis by J. Jakob gave Ta_2O_5 83·00, Nb_2O_5 2·56, FeO 13·62, MnO 0·62, TiO_2 0·22, H_2O+ 0·07 = 100·09. L. J. S.

Casasopra (S.). *Note morfologiche intorno a un quarzo acuminato della Valle Leventina (Ticino).* Schweiz. Min. Petr. Mitt., 1939, vol. 19, pp. 261–284, 1 pl., 4 text-figs.

Goniometric measurements of a small, acute pyramidal crystal of quartz show a long series of rhombohedra from $(19.0.\overline{19}.20)$ to $(46.0.\overline{46}.1)$ and several small vicinal trapezohedra, several of which are new crystal-forms. L. J. S.

Parker (R. L.), Quervain (F. de), & Brandenberger (E.). *Gadolinit aus den Schweizeralpen.* Schweiz. Min. Petr. Mitt., 1940, vol. 20, pp. 11–16, 2 figs.

Small (1–2 mm.) crystals of gadolinite, associated with quartz, adularia, albite, haematite, chlorite, synchysite, xenotime, and monazite, occur in Alpine crevices at Piz Blas, Val Nalps, Graubünden. They are olive-green and transparent with brilliant vitreous lustre, and with their prismatic habit (along the *a*-axis) they much resemble epidote in appearance. Sp. gr. 4·2, α near 1·754, 2V large, positive, axial plane (010); pleochroism, α grass-green with bluish tinge, β olive-green with reddish tinge. Forms *c i q m p o* [Dana's letters]. X-ray measurements give a $4{\cdot}6_5$, b $7{\cdot}5_3$, c $9{\cdot}8_7$ Å., β $89\frac{1}{2}°$, the unit cell containing two molecules

$Yt_2FeBe_2Si_2O_{10}$; space-group $C_{2h}^5 = P2_1c$. This is regarded as a gem variety of gadolinite, as distinct from the large coarse black crystals in pegmatites. L. J. S.

Parker (Robert L.) & Quervain (F. de). *Ein alpines Vorkommen von Kainosit.* Schweiz. Min. Petr. Mitt., 1940, vol. 20, pp. 289–294, 4 figs.

Two light brown crystals, associated with quartz, albite, and red blende from crevices in granite near Guttannen, Bernese Oberland, are identified as kainosite. Goniometric measurements gave $a : b : c = 0{\cdot}9418 : 1 : 0{\cdot}8964$, with eleven crystal-forms and a pseudo-tetragonal habit about the *b*-axis. Sp. gr. 3·54, α 1·658, β 1·682, γ 1·687, 2V 40°, negative. Microchemical tests showed the presence of Ca and Si (rare-earths not tested for). These crystals are larger (about 1 cm.) than those of the three previously known occurrences of kainosite, and different in their paragenesis. [M.A. **4**–335.] L. J. S.

Kato (Takeo), Yamaguti (Tosio), Ogawa (Udao), & Yosida (Teizi). *The sulphur deposits of the Yonago-Ogusi type.* Japanese Journ. Geol. Geogr., 1940, vol. 17, pp. 251–282, 2 pls., 22 text-figs.

Descriptions are given of the sulphur deposits that are worked in the craters of extinct volcanoes at the Yonago mine in prov. Sinano, Ogusi mine in prov. Kôzuke, Akakura mine in prov. Ugo, and Sikabe mine in Hokkaido. These have the same characters as those of the Horobets-Matsuo type [M.A. **6**–31], differing in their mode of origin as massive impregnation deposits formed by solfataric action beneath the surface, while the latter are sedimentary deposits formed in boiling crater lakes. The ore consists of massive sulphur with grains of black iron sulphide, and was formed by the partial oxidation of H_2S, with accompanying opalization and alunitization of the country-rock. L. J. S.

Watanabe (Takeo). *Eruptions of molten sulphur from the Siretoko-Iôsan volcano, Hokkaidô, Japan.* Japanese Journ. Geol. Geogr., 1940, vol. 17, pp. 289–310, 12 figs.

In 1936 flows of molten sulphur were erupted from a parasitic crater on the dormant volcano at intervals of 3–5 days during several months, followed by geyser eruptions of acid water and steam. The material came from a chamber, 8–25 metres beneath the surface, which was fed by the melting of sulphur of fumarolic origin in the andesitic agglome-

rate. The flows present the characters of lava flows with a cascade ('sulphur-fall'), and they fill a valley for a distance of 1400 metres, about 50,000 tons of sulphur being added by each eruption. Sulphur sand is carried by the river to the sea-shore. Stalactites and stalagmites, small bubbles of sulphur, and in vugs acicular crystals of monoclinic sulphur are found. Analyses gave up to 99·94 % S, and spectroscopic analysis shows the presence of Ba, Sr, Cu, Sc, Ti, Zr, V, &c.

L. J. S.

Krieger (Philip). *Bornite-klaprotholite relations at Concepcion del Oro, Mexico.* Econ. Geol., 1940, vol. 35, pp. 687–697, 10 figs.

Polished sections of massive bornite from Aranzazu mine, Concepcion del Oro district, Zacatecas, show inclusions of pinkish creamy white, moderately anisotropic klaprotholite, as rectangular crystals (0·05 mm.), oriented rods and blades (up to 1·5 mm.), irregular grains, and graphic intergrowths. These were formed with the bornite by unmixing (exsolution). The ore is veined with chalcosine, which replaces bornite but not klaprotholite. M. A. P.

Kleber (Willi). *Kristallographische Untersuchungen am Aragonit unter besonderer Berücksichtigung des Vorkommens am Erzberg, Steiermark.* Neues Jahrb. Min., Abt. A, 1940, Beil.-Bd. 75, pp. 465–485, 4 pls., 11 text-figs.

Crystal-forms on aragonite from Erzberg, Styria, are described and compared with those from other localities. Etch-figures produced by *d*-tartaric acid are symmetrical on (010) and (001), but unsymmetrical on (110). Laue photographs and optical examination of slices parallel to (001) show that transformation to a granular aggregate of calcite commences at about 400° C. and proceeds slowly up to about 420° C.

L. J. S.

Koritnig (Sigmund). *Barytkristalle vom Magdalensberg in Kärnten.* Zentralbt. Min., Abt. A, 1940, pp. 105–112, 10 figs.

Three types of baryte crystals are described. L. J. S.

Foshag (William F.). *Sodium bicarbonate (nahcolite) from Searles Lake, California.* Amer. Min., 1940, vol. 25, pp. 769–778, 12 figs.

A drill core from a well in the central salt crust of Searles Lake shows the presence of abundant nahcolite at various depths from 122 to 289

feet. Clear, colourless, glassy crystals 1 to 2 mm. long, and showing the forms (110), (101), (010), (111), ($\bar{1}$01), often twinned on (101), give Na_2O 36·74, CaO 0·20, $(Fe,Al)_2O_3$ 0·16, CO_2 51·15, H_2O 10·76, insol. 0·82, total 99·83. Various forms of contact and penetration twins are figured. The mineral has a vitreous lustre which is somewhat resinous on the perfect (101) cleavage. A good (111) and distinct (100) cleavage are also mentioned. Cleavage plates on (101) show a negative biaxial figure 2V 75°, $\gamma = b$, $\alpha : c = 27°$. Indices of refraction, α 1·375, β 1·505, γ 1·583, are close to those given for artificial $NaHCO_3$. The paragenesis of nahcolite from Searles Lake, from Stufe de Nerone, Naples, from Vesuvius, and from Magadi Lake is discussed. [Min. Mag. **22**–53.] F. A. B.

Durrell (Cordell). *New data on the optical properties of tridymite.* Amer. Min., 1940, vol. 25, pp. 501–502.

Untwinned crystals of tridymite up to 1 mm. across and aragonite-type twins occur in andesite near Portola, Plumas Co., California. Values of 2V measured on the universal stage vary from 66° to 90°; refractive indices are α 1·478, β 1·479, γ 1·481. The birefringence of a thin section is 0·0025. F. A. B.

Hugill (W.). *A note on mullite.* Trans. Brit. Ceram. Soc., Stoke-on-Trent, 1940, vol. 39, pp. 121–123, 4 figs.

Two orthorhombic varieties of mullite have been distinguished optically in slags and firebricks. The normal form has α 1·642, γ 1·654, elongation parallel to γ; of less common occurrence is the form with α 1·600, γ 1·610, elongation parallel to α. The latter form grows as larger crystals. No X-ray data have yet been obtained to relate these two varieties to the three described by Rooksby and Partridge [M.A. **8**–14]. F. A. B.

Taylor (E. D.). *The morphology of columbite crystals.* Amer. Min., 1940, vol. 25, pp. 123–138, 2 figs.

By Weissenberg methods M. A. Peacock has confirmed Sturdivant's [M.A. **4**–366] space-group determination of columbite to be $D_{2h}^{14} = Pcan$. A study of the habit of columbite crystals shows that (100) should be a full plane of symmetry, not a glide-plane. This would lead to an erroneous determination of the space-group as $D_{2h}^{7} = Pman$.

F. A. B.

Galbraith (F. W.). *Identification of the common tellurides.* Amer. Min., 1940, vol. 25, pp. 368–373.

Testing with concentrated HNO_3 aids the identification of tellurides in polished ore sections. [M.A. **5**–4, **7**–262.] F. A. B.

Lukesh (Joseph S.). *Thermal decomposition of arsenopyrite.* Amer. Min., 1940, vol. 25, pp. 539–542, 2 figs.

Crystals of mispickel heated in an evacuated silica tube decompose at 650° C. into silvery hexagonal plates of arsenic and yellowish non-magnetic polycrystalline pyrrhotine. The identification of these products was carried out by X-ray powder photographs. F. A. B.

Lukesh (Joseph S.). *Optical evidence of polysynthetic twinning in arsenopyrite.* Amer. Min., 1940, vol. 25, pp. 619–623, 4 figs.

Polished sections of crystals of mispickel examined under polarized light show pinakoid twin striations. Twin striae have also been observed on crystals of manganite. [M.A. **6**–409, **7**–81, **7**–231.] F. A. B.

McConnell (Duncan) & Gruner (John W.). *The problem of the carbonate-apatites. III. Carbonate-apatite from Magnet Cove, Arkansas.* Amer. Min., 1940, vol. 25, pp. 157–167, 2 figs.

Microscopic examination of non-fibrous transparent specimens of apatite from Magnet Cove reveals the presence of two varieties: one close to fluor-apatite with ω 1·633, ϵ 1·629; and the other carbonate-apatite with $\gamma = \omega$ 1·632, $\alpha = \epsilon$ 1·625. The more birefringent mineral liberates CO_2 when treated with acid but the presence of aragonite or calcite could not be detected. F. A. B.

Laudermilk (J. D.) & Woodford (A. O.). *Hydrous iron sulphide in California crystalline limestone.* Amer. Min., 1940, vol. 25, pp. 418–424, 1 fig.

Bluish-black calcite-forsterite rock from Cascade Canyon contains 2 % pyrite and 1 % FeS, probably hydrotroilite, the latter being soluble in oxalic acid. A similar rock from Riverside loses its black pigment on treatment with citric acid. This pigment is considered to be a hydrous iron sulphide, probably hydrotroilite. Some previous descriptions of so-called melnikovite may correspond to hydrotroilite. F. A. B.